THE IRON TRADE REVIEW

VOLUME XL CLEVELAND, JANUARY 3, 1907 NUMBER 1

BRIGHT PROSPECTS

MAY BE MARRED BY UNEXPECTED EVENTS,

But Industrial Conditions Are Sound.--Higher Prices for Bessemer Rails Announced by Independents.—Heavy Buying of Pig Iron in the East.

The new year opens with the market very strong and with the confident expectation of manufacturers that prosperity will continue during the next 12 months, unless interfered with by unforeseen political or financial events.

Possible Dangers. The old year was remarkable not only in its great prosperity, but also in the fact that stock quotations show in many cases net losses instead of the advances which usually accompany boom periods. It is predicted in some quarters that as the annual inventories will show losses in stock values, the result may be depressing on business. These fears are usually entertained by business men who are not in harmony with efforts made during the past year, some of them doubtless ill-advised, to reform conditions. The mere fact that such views prevail at all and also that fear of possible effects of the presidential election increases as the time for the election approaches may tend to make buyers more conservative and it will not be surprising if we witness a little sagging in quotations toward the latter part of the year; but in actual industrial conditions there is nothing to justify anything but the most optimistic prophecies.

Demand Very Strong. The demand for all kinds of material is much stronger than it was a year ago, and there are no indications that producing capacity will be greater than the demand, except perhaps in the case of a few small industries. The increase in consuming capacity, especially in the east, during the past year has been tremendous.

Advance in Rails. Two large eastern Pennsylvania rail manufacturers have announced that they will not take any more orders for standard sections for delivery after August, except at $30, an advance of $2 per ton. This is the highest price asked for Bessemer rails since 1900. The action is significant as indicating an increasing spirit of independence among manufacturers and as illustrating the fact that failure of manufacturers to agree does not always result in lower prices. It is not expected that the leading producer will advance quotations. The action of the independents emphasizes the strength of the finished material market, where the advances have not been so rapid as in crude and semi-finished materials.

Pig Iron is Firm. The last days of the old year were very active in the pig iron market in the east and in Chicago, but in other centers buyers were more conservative. In Philadelphia, where prices for spot iron have advanced 36 per cent during the year, the market shows no indications of weakening, and basic is especially strong. In the Cleveland district foreign iron has appeared again after an absence of nearly five years. In the south the railroads are making strenuous efforts to improve deliveries, but up to date their success has not been pronounced. Southern furnaces are in a very strong position and well prepared to resist any tendency of buyers to insist upon lower quotations. There is apparently no speculative southern iron for the first half of the year, and warrant yards will have very little influence.

Slow Deliveries. Very few mills are now able to deliver sheets in less than 12 weeks. Specifications on plates continue to be extremely heavy. The buying of merchant bars is still active and the tremendous demand for wire products has not diminished.

Coke Shortage. The decline in prices of scrap at Chicago, recently noted, has been felt in some other centers, but there is not yet much indication of weakness. The coke market is strong, but the demand for foundry coke has declined in the Pittsburg district, as it usually does at this time of the year. A serious coke shortage exists in the Chicago district, but the output of the local by-product ovens is doing much to relieve what would otherwise be a very alarming situation.

A mortgage recently filed by the Inland Steel Co., of Chicago to the First Trust & Savings Bank, of that city, and Emil K. Boisot, trust officer of the Trust Co., as trustee, secures an issue of $2,500,000 5 per cent first mortgage sinking fund gold bonds. The mortgage covers the Indiana Harbor mill property, the Indiana Harbor blast furnace property, the Chicago Heights property and the Minnesota mining leasehold, together with all buildings, blast furnaces and other improvements or fixtures appurtenant to these premises. The officers of the company are: Charles Hart, president; A. S. Hook, secretary, and P. D. Block, treasurer.

John H. West, president of the Bellefontaine Bridge & Steel Co., a newly organized corporation, offered $25,000, the highest bid received, for the real estate and plant of the Bellefontaine Bridge & Iron Co., when they were offered at public sale at Bellefontaine Ohio. This company was one of the concerns dissolved by the ouster proceedings brought by Attorney General Ellis of Ohio. The merchandise, contracts, etc., valued at $8,000, will be offered privately.

A raise in wages, effective immediately, for all employes of the American Shipbuilding Co. at that corporation's yards along the lakes has been announced at the yards at Lorain, O. Men who are receiving $2.25 or less a day will receive a 10 per cent increase. Those earning more than this sum will get 5 per cent.

THE WEEK IN IRON CENTERS.

PITTSBURG.

New Year Opens With Prices Strong and Prospects Very Favorable.

Office of THE IRON TRADE REVIEW, 521 PARK BUILDING, JAN. 2.

A strong, quiet market, with steady, strong prices, a fair inquiry for pig iron for third and fourth quarter delivery, and a very heavy demand for deliveries on finished material, were the features of the week under review. The holidays had their usual effect of producing a temporary inactivity as far as placing new business was concerned, but renewed action is expected from this time and almost without exception the leading factors in the business announce that as far as they can see there is no indication of anything but an exceedingly busy year ahead.

The nominal market on semi-finished material has advanced, but since the advance in merchant pipe and boiler tubes, as announced last week, there has been no change in the price of finished lines.

A rumor to the effect that two rail mills, outside of the Pittsburg district, had advanced standard rails to $30 per ton for last half delivery was reported, but as far as local mills are concerned this has not even been discussed. The leading producer is not filled up enough for last half of the year to enable independent makers to take advantage of the situation to advance prices or exact a premium.

The great pressure at this time is to make shipments of finished material. Specifications are tremendously heavy on plates, wire products, sheet products and steel bars. Premiums are being secured by independent manufacturers of sheet products and steel bars for prompt deliveries, but this premium business is very small in comparison with the whole volume of transactions:

Pig Iron.—The past week has been very quiet, both as far as actual sales were concerned for either prompt or future delivery, first quarter being practically prompt. Northern No. 2 foundry iron for second quarter is quoted $24.60, delivered Pittsburg, or on a basis of $23.75, valley furnace, this being the figure at which foreign iron is being placed in this market. Last half No. 2 northern is quoted $22 valley furnace, and third quarter $23.50 valley, nominal. First and second quarter foundry quotations are very erratic, depending entirely upon the furnace having iron for these deliveries, and half a dozen furnaces will have as many different prices for their iron. First quarter Bessemer is held nominally $23.50 to $24, although one sale of 2,000 tons for first quarter is reported by a furnace interest at $22.50, valley, the statement being made by the seller that there were no strings tied to it and that the sale was a straight transaction. Southern iron for first quarter is very scarce, furnaces being unable to make shipments on account of inadequate railroad accommodations. Prompt iron is quoted $23, Birmingham, nominally, second quarter $19.50, Birmingham and third quarter $18.50. For second quarter delivery we quote as follows:

Bessemer Valley	22.00 to 23.00
Bessemer, Pittsburg	22.85 to 23.85
No. 1 Foundry, Pittsburg	24.35 to 24.60
No. 2 Foundry, Pittsburg	23.85 to 24.35
Gray Forge, Pittsburg	22.85 to 23.35
Basic, Valley	22.00 to 22.55
Basic, Pittsburg	22.85 to 23.30

Ferro-Manganese.—One small lot of ferro-manganese, foreign, 80 per cent, is reported sold during the week at $80, Pittsburg, but the nominal market for January delivery is quoted $82.50. Ferro-silicon, 50 per cent, is quoted $108 to $110 and 12 per cent $36.

Skelp.—In the absence of any real market, we continue to quote the following nominal prices on light gauges and narrow widths, with the usual differentials on heavier stock:

Bessemer grooved, 1.70c to 1.75c; sheared, 1.70c to 1.75c; basic, grooved, 1.80c to 1.85c; sheared, 1.75c to 1.80c; iron skelp, 2.15c to 2.25c

Steel.—Soft Bessemer billets are now quoted $31.00 Pittsburg on 4 x 4, and sheet and tin bars are quoted at the same figure. Open-hearth steel billets are quoted $33.00 to $34.00, and except in cases where the buyer must specify or lose some of his contract tonnage, semi-finished is very hard to obtain. There is very little steel to be disposed of by brokers, as the leading producers have adopted a policy in selling to middlemen.

Plates.—Specifications, amounting to actual orders were almost as heavy during the past week as they have been before and mills are actually swamped and far behind. The advance of eastern mills has not been followed by Pittsburg mills and we quote as follows:

Tank plate ¼-inch thick, 6¼ to 100 inches, 1.70c f. o. b. mill, Pittsburg. Light plate schedule, No. 10, 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c. Extras on the regular plate schedule are as follows per 100 pounds: boiler and flange steel plates 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketch-

AVERAGE PITTSBURG PRICES OF IRON AND STEEL DURING 1906.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bessemer Pig Iron	17.32	17.20	17.20	17.25	17.24	17.38	17.57	17.96	18.44	20.06	21.94	22.75
No. 2 Northern Foundry	18.40	18.10	18.00	17.60	17.50	17.10	17.35	18.85	19.85	21.35	23.85	24.60
Gray Forge Iron	17.00	17.85	17.20	16.55	16.45	16.35	16.40	17.25	18.00	19.15	20.60	22.00
Bessemer Billets	27.25	27.50	27.50	27.50	27.60	27.00	27.25	27.75	28.50	28.50	28.50	30.00
Rails (standard)	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Rails (20 lbs)	28.50	28.50	28.50	28.50	24.50	28.50	29.00	30.50	32.00	33.00	33.00	33.00
Beams and Channels	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Tank Plate	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.70
Steel Bars, Bessemer	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.60	1.60
Common Iron Bars	2 c	1.85	1.80	1.55	1.55	1.55	1.55	1.60	1.60	1.60	1.75	1.80
Muck Bar	31.50	30.50	29.70	29.50	28.70	29.00	29.00	30.25	31.50	31.75	34.50	36.50
Steel Skelp, Grooved	1.65	1.65	1.65	1.65	1.57½	1.57½	1.57½	1.60	1.62½	1.62½	1.67½	1.70
Iron Skelp, Grooved	1.65	1.65	1.65	1.65	1.65	1.65	1.75	1.80	1.80	1.80	2.05	2.15
Sheets, No. 28, black	2.40	2.40	2.40	2.40	2.40	2.50	2.50	2.50	2.50	2.60	2.60	2.60
Sheets No. 28 Galvanized	3.45	3.45	3.45	3.45	3.45	3.55	3.55	3.55	3.55	3.65	3.65	3.65
Sheets (blue annealed)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.80	1.80
Roofing (Painted)	1.65	1.65	1.65	1.65	1.65	1.75	1.75	1.75	1.75	1.75	1.85	1.85
Roofing (galvanized)	3.00	3.00	3.00	3.00	3.00	3.10	3.10	3.10	3.10	3.10	3.15	3.15
Tin Plate	3.50	3.50	3.50	3.60	3.75	3.75	3.75	3.75	3.75	3.75	3.90	3.90
Wire Nails	1.85	1.85	1.85	1.85	1.8	1.85	1.85	1.85	1.85	1.85	1.90	2c
Ferro-Manganese	175.00	150.00	140.00	125.00	89.00	79.00	87.50	86.50	88.25	80.00	80.00	82.50
Foundry Coke	3.25	2.85	2.75	3.00	2.70	2.60	2.80	3.20	3.55	3.70	3.85	4.00
Furnace Coke	3.00	2.40	2.35	2.60	2.55	2.40	2.55	2.70	2.75	2.85	3.20	3.60

es, excepting straight taper plates varying not more than four inches in width at ends, narrowest end not being less than 30 inches, 0.10c; complete circles, 0.20c. Plates in width over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1.00c. Gauges under ¼-inch to and including 3-16-inch plates on thin edges, 0.10c; under 3-16 inch to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—The best average delivery the leading interest can make on sheets is about 12 weeks, and the independent producers, while they are in shape in most cases to do a little better than this, are filled to capacity for their contract period, the policy being not to sell as far ahead as the leading interest. Where reasonably prompt delivery can be made, premiums of $1.00 to $1.50 a ton can readily be obtained. The new Lusiness is greatly in excess of that usually received at this time of the year and prices are very firm. There has been some difficulty in securing an adequate supply of semi-finished material. We quote:

Black steel sheets, one pass, cold rolled: Nos. 11-12, 2.20c; Nos. 13-14, 2.25c; Nos. 15-16, 2.30c; Nos. 17-21, 2.35c; Nos. 22-24, 2.40c; Nos. 25-26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 29, 2.75c; No. 30, 2.85c; galvanized, Nos. 10-11, 2.55c; Nos. 12-14, 2.65c; Nos. 15-16, 2.75c; Nos. 17-21, 2.90c; Nos. 22-24, 3.04c; Nos. 25-26, 3.25c; No. 27, 3.45c; No. 28, 3.65c; No. 29, 3.90c; No. 30, 4.15c. Corrugated roofing, $1.85 per square for No. 28 painted, 2½ inch corrugation and $3.15 per square No. 26 galvanized, 2½ inch corrugation. Blue annealed sheets, No. 10 and heavier 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c.

Tin Plate.—As in case of sheets, 12 weeks is about the best mill delivery to be had, although jobbers who specified early on their contracts are able to make prompt deliveries from stocks. Instead of making their regular stocks for spring trade, the mills have been kept running busily on current deliveries, and the spring trade will find but very little tin plate stored up for the heavy movement. The car shortage has seriously delayed shipment from the mills. We quote:

Coke tin plate, 100-pounds basis, 14 x 20, $3.90 f. o. b. mill, Pittsburg district. Terms, 30 days, less two per cent for cash in 10 days.

Merchant Bars.—The holiday season has had some influence on the new tonnage booked, but the buying tendency, which has been so strong through the last three months, has not subsided in the least. Specifications for delivery are very heavy, and the biggest question now is in making deliveries. There is no inclination on the part of the leading steel bar interests to advance prices, and the absolute minimum on new business is 1.60c base Pittsburg. Bar iron has been moving slowly at 1.85c base Pittsburg. We quote:

Common iron bars, 1.85c Pittsburg in carload lots and over, 1.90c in less than carloads; Bessemer steel bars, 1.60c; plow and cultivator, 1.60c, net; channels, angles, zees, tees, under three inches, 1.70c, all f. o. b. Pittsburg. The following differentials are maintained on steel: less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size 0.30c advance. Cold rolled and ground shafting, 50 per cent off in carload lots, and 5 per cent off in less than carloads delivered in base territory; open-hearth spring steel, 2.25c to 2.50c, sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. The price of planished and machine straightened tire is 1.80c, base, half tire extras. Iron finished tire up to 1½ inch by ½ inch, 1.75 base, half extra, tire list. Iron tire 1½ inch by ½ inch and over to be sold on regular bar basis of 1.60c base, half extras, steel card.

Muck Bar.—There is practically no market on muck bar, and a nominal quotation of $37.00 Pittsburg for all pig metal bar is given. Ordinary sellers are using their entire surplus and leaving very little for the outside consumer. Scrap bar is quoted $33.50 to $34.00.

Hoops and Bands.—This is the off season in this market and the new buying is not expected much before April or May, and for this reason new contract tonnage is light, but specifications are heavy and mills are running about even on deliveries; this market being in better shape from a delivery standpoint than any of the other finished lines.

Hoops, in carload lots, 2c; in less than carload lots, 2.10c; bands 1.60c base, half extras as per standard steel card. Prices f. o. b. Pittsburg.

Structural Material.—New business has been light during the week, but with the month before the holidays as a criterion a big tonnage is expected during January, there having been a gradual increase in the bookings during the last two weeks of November and through December. There are half a dozen big jobs being figured on throughout the country and construction companies are getting busy and seeking business, where, six weeks ago and through the fall and summer they were resting and endeavoring to put through what was already on the books. The big part of this was cleaned up before the bad weather and the business now is for early spring construction. With the increased structural capacity of the mills during 1906, deliveries on shapes should be very good although the plate element is going to enter as a deterrent. We quote, unchanged, as follows:

Beams and channels, 15 in., and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.70c; angles from three to six inches, inclusive, 1.70c; over six inches, 1.80c; universal and sheared plates, 6¼ inches and wider, 1.60c base.

Wire and Wire Nails.—The holidays had absolutely no effect on the immense volume of business and the demand for wire products was as heavy during the week under review as previously. There has been no change in prices, but an advance is looked for about the middle of January. Reports from all parts of the country are to the effect that mills are filled up to capacity for the contract period, and practically unable to take on further business. We quote as follows:

Wire nails, jobbers' carload lots, $2; retailers' carload lots, $2.05c; less than carloads $2.10; painted barb wire, $2.15, for jobbers in carloads; retailers in carloads $2.20; and less than carloads, $2.30, with 30c for galvanizing; plain wire, $1.85 for jobbers and $1.90 by carload.

Rails and Track Material.—The week under review has been comparatively light as far as sales are concerned on standard sections. Although there has been the usual heavy demand for light rails, the entire sale for light and standard sections during the week did not amount to over 10,000 tons, this presumably on account of the holiday season. Exact figures as to the tonnage carried over into the new year are not obtainable, but is estimated to be about two months' running of the mills. We continue to quote:

Fifty pounds and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32, 8-pound, $39; 12-pound, $35; 16-pound, $33 to $34; 20 to 45-pound $32 to $33; angle splice bars for standard sections, $1.65; spikes $2.50 to $2.75 for forward deliveries.

Merchant Pipe.—There is one big inquiry for line pipe in the market and an effort was made to close it up before the end of the year in order to have it come in under 1906 business,

but negotiations were not far enough along to bring this about. When closed, this contract will equal any single order placed last year. The advance of $2 a ton on Dec. 21 will probably be followed by still another within a very short time, the present discounts making merchant steel pipe $43.70 per ton on base sizes and an advance of $5 over this would not be surprising within the next 30 days, although the leading interest has given no intimation of its intention in this direction. A considerable tonnage of business not considered strictly desirable has been refused on account of the tonnage now on the books. Jobbers are being quoted only for their period of 60 days, while consumers, in order to get material for their requirements have placed business about as far ahead as the pipe mills will accept it, three months being an early delivery. Prices are very firm, jobbers' discounts being 77 basing, base sizes and 5. Consumers' carloads basing discounts are as follows:

	Steel black	Steel galv.
⅛ to ¼ inch	67	51
⅜ inch	69	55
½ inch	71	59
¾ to 6 inches	75	65
7 to 12 inches	70	55
EXTRA STRONG PLAIN ENDS.		
⅛ to ⅜ inch	60	48
½ to 4 inches	67	55
4½ to 8 inches	63	51
Double extra strong plain ends, ⅛ to 8 inches	50	45

Boiler Tubes.—There is still a very heavy business in both merchant and locomotive boiler tubes and specifications against contracts are heavy. The advance of $4 per ton went into effect Dec. 20 and is being strictly maintained. We quote:

Boiler tubes.	Steel	Iron
1 to 1¼ inches	48	48
1¾ to 2¼ inches	60	43
2½ inches	62	43
2¾ to 5 inches	68	55
6 to 13 inches	60	43

Less than carloads two points less.
2½ inches and smaller, over 18 feet, 10 per cent, net, extra.
2¾ inches and larger, over 22 feet, 10 per cent, net extra.

Wrought Iron Pipe.—The following nominal basing discounts are quoted and the demand is extremely heavy and wrought pipe hard to secure on new contracts, makers being heavily booked up and most of them asking 10 to 15 per cent premium. We quote jobbers' carloads:

	Card Weight black	Card Weight galv
⅛, ¼ and ⅜ inch	62	46
½ inch	65	54
¾ to 4 inch	70	60
PLUGGED AND REAMED.		
1 to 4 inch	63	58
EXTRA STRONG PLAIN ENDS.		
⅛, ¼ and ⅜ inch	56	43
½ to 4 inch	62	50
DOUBLE EXTRA STRONG.		
½ to 4 inch	51	40

Coke.—The market is very strong and prices firm, but the demand for foundry coke has fallen off during the past ten days, as it usually does at this time of the year, either on account of consumers filling up on the fag ends of their low priced contracts or holding off shipment on account of the inventory period. Furnace coke is still scarce and prices are firm. On Standard Connellsville foundry coke we quote $4 to $4.25 for shipment during the first half and $3.85 to $4 on contract for the year. Furnace coke is quoted $3.65 to $3.85 for spot shipment and $3.10 to $3.35 for the year.

Old Material.—With a fair movement scrap prices have shown a slight decline in several of the branches, but notwithstanding this, prices are still high as far as consumers are concerned, and they are holding off until prices reach more nearly the level of their ideas. Most of the transactions throughout the week have been between dealers. We quote as follows:

Heavy melting scrap, $19 to $19.50; re-rolling rails, $21.50 to $22; bundled sheet scrap, $16 to $16.50; iron axles, $31 to $31.50; old iron rail, $26.50 to $27. No. 1 wrought scrap, $21 to $21.50; old car wheels, $23 to $23.50; low phosphorus scrap, $23.50 to $24; machine shop turnings, $15 to $15.50; axle turnings, $16.75 to $17.25; cast borings, $12.25 to $12.50; No. 1 cast scrap, $20.50 to $21.

CHICAGO.

Advance in Rails Illustrates Strength of Market.—Pig Iron Prices Higher.

Office of THE IRON TRADE REVIEW, 1362 MONADNOCK BLOCK, Dec. 31.

The feature of the market this week is the announcement of eastern Pennsylvania makers that they are asking premiums on quick shipments of Bessemer rails. This is the first time since the $28 schedule was established several years ago that a higher price has obtained on this product, a fact which aptly illustrates the extremely strong position of all forms of finished material. The steel corporation continues to quote $28, and local officials do not anticipate any change, although it has very little unsold capacity for 1907 to offer. The Illinois Steel Co. disposed of its entire rail output for the coming year early last summer and since that time has been diverting tonnage to the Carnegie Steel Co. The car shortage is working havoc with rail deliveries from the local mill, the rolling schedule there being changed daily according to the shipping facilities offered. In other forms of finished material also, serious delays to shipments has been occasioned by the lack of cars and tonnage is accumulating on mill yards to the serious detriment of rolling operations. The supplies of coke and pig iron from eastern and southern producing points show a steady decrease due to the same cause, and the immediate outlook to western consumers is anything but sanguine.

There is a brisk demand for pig iron and prices have noticeably strengthened in the week under review. Some relief from the local congestion will be felt after next week by the blowing in of the new stack of the Federal Furnace Co., which will have an output of 350 tons daily. Excepting car wheels, all forms of scrap are weak. The former are quoted at $25, Chicago, and several thousand tons have been disposed of in the last few days at this price.

Pig Iron.—Pig iron is alarmingly active. Usually at the commencement of a new year, the market is dull and of a vacillating tendency, but this feature is wholly lacking today. On the contrary, a buying movement is in evidence with such momentum that it cannot be headed off. The situation is alarming because a serious coke shortage confronts furnace operators. Behind in their deliveries thousands of tons and confronted with an abnormally and phenomenally heavy melt, a fuel famine could not have come at a worse time. Despite the fact that local operators have their men on the ground, shipments from the Pocahontas field are only one-tenth the contract requirements, while from the Connellsville and West Virginia regions they are less than one-half what they should be. With the first bad weather, this delinquency is sure to be increased, and it is felt that some furnaces then may have to bank or go out of blast. Both buyers and sellers seem to have foreseen this contingency, and the result is an increasing demand and a stiffening of prices. The inquiries in the hands of sellers today range from 25,000 tons of malleable down to car lots of foundry irons. All grades are under negotiation and all kinds of deliveries are wanted. The bulk of the inquiry is for the last half, but there is enough tonnage wanted for the first and second quarters to indicate that a big gap for this period is unprotected.

Prices have been revised to meet the changing conditions. Some southern furnaces are asking on the basis of $23 Birmingham for January and February shipments; others from $22.50 to $23.50 for the first quarter. For the second quarter, schedules range from $19.00 to $20 Birmingham, and for the third quarter, $18.50 to $19.50 is asked. Virginia furnaces decline to sell for less than six months' delivery, and are asking $23 furnace for the first half; $22 for the second half, and $21 for the entire

year. It is hard to get a quotation from northern furnaces, their future being full of hazard owing to the coke shortage. Nominally, however, the market ranges from $26.50 to $27.50 on No. 2 foundry, Chicago, for the first half, and from $22.50 to $23.50 for the last half. It is a fact, however, that the former relations between the buyer and seller determine in a large measure the consideration given his new wants. The maximum price in the following table are for first quarter shipments. The minimum prices for second quarter. The 45-cent freight advance in Birmingham irons, effective Feb. 1, is not included, and will not be added until the same goes into effect.

Lake Superior charcoal	$26.00 to 27.00
Northern Foundry No. 1	26.00 to 27.00
Northern Foundry No. 2	25.50 to 26.50
Northern Foundry No. 3	25.00 to 26.00
Northern Scotch Foundry	26.00 to 27.00
Ohio Strong Softeners No. 1	26.30
Ohio Strong Softeners No. 2	25.80
Southern Foundry No. 1	24.40 to 26.90
Southern Foundry No. 2	23.90 to 26.40
Southern Foundry No. 3	23.40 to 25.90
Southern Foundry No. 4	22.90 to 25.40
Southern No. 1 Soft	24.40 to 26.90
Southern No. 2 Soft	23.90 to 26.40
Southern Gray Forge	22.40 to 24.90
Southern Mottled	21.90 to 24.40
Southern Silveries 4 per cent to 6 per cent Silicon	27.40 to 29.90
Jackson Co. Silveries, 8 to 10 per cent Silicon	31.40 to 33.40
Malleable Bessemer	25.50 to 26.00

Billets.—It continues impossible to secure a quotation on any reasonable tonnage of forging billets for early delivery from local makers. Crude steel of any description for the first half is very scarce, and there is a strong disposition on the part of manufacturers to conserve their unsold supply until the market for the new year develops more clearly. The last quotation made on forging billets was $36 Chicago, and on wire rods $39 Chicago.

Iron and Steel Bars.—The tightly sold condition of western steel bar manufacturers for 1907 deliveries precludes the possibility of much new tonnage being booked by these interests. Nevertheless, there is a good inquiry from implement manufacturers and other consumers whose contracts expired with the end of 1906. Most of this is diverted to eastern manufacturers. Specifications are very heavy, but deliveries are slow. Bar iron is moving freely on the basis of 1.65c Pittsburg, or 1.81½c Chicago. Specifications are free, and local plants are operating to their maximum capacity. We quote official prices, as follows:

Soft steel bars and bands, 1.76½c, half extras; soft steel angles, less than 3 x 3, 1.86½c; hoops, 2.16½c base. full extras; old rail stock 1.70c. We quote bar iron from stock, 2.20c; full extras; soft steel rounds and squares, 3 inches and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by 1⅛ inch and larger, $2 per 100 pounds base; 4½ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half rounds, $2 per 100 pounds base; steel bands, $2, half extras; soft steel hoops, 2.40c to 2.50c full extras. Other sizes not mentioned above, $2 per 100 pounds base plus half extras.

Merchant Steel.—Store sales show a steady improvement owing to the inability of mills to quickly satisfy the wants of their customers. Specifications are very heavy and little headway is made on the deferred tonnage. We quote carload lots, Chicago delivery, as follows:

Planished or smooth finished tire steel, 1.96½c; iron finish, up to 1½ x ¼ inch, 1.91½c; iron finish 1½ x ½ inch and larger, 1.76½c, base; channels for solid rubber tires, ¾ to 1 inch, 2.26½c, and 1⅛ inch and larger 2.16½c; smooth finished machinery steel, 2.01½c; flat sleigh shoe, 1.81½c; concave and convex sleigh shoe, 2.06½c; cutter shoe, 2.35c; toe calk steel, 2.31½c; railway spring, 1.96½c; crucible tool steel, 6½c to 8c, and still higher prices are asked on special grades. Shafting is very strong and an advance is expected. Quotations are without change at 50 per cent off in car lots and 45 per cent in less than car lots, in base territory.

Merchant Pipe.—There is no change in the situation at mills. The congestion as a result of the car shortage is a bad one. Specifications are without diminution and deliveries are falling further behind. We quote mill shipments, Chicago delivery, as follows: ¾ to six-inch black steel pipe, 75.35 per cent discount; galvanized, 65.35 per cent discount. From store in small lots, Chicago discounts are 72 per cent to 73 per cent on the base sizes.

Boiler Tubes.—The recent advance of two points has been well received by the trade. All the large jobbers and consumers covered for their forward requirements at the lower prices and new tonnage is not expected to be very brisk for some weeks. Specifications, however, continue heavy, though deliveries are slow. We quote official discounts, carload lots, Chicago delivery, as follows: 2¾ to five inches, steel, 66.35c; iron, 53.35c. On less than carload lots from store we quote 58 per cent off for steel; 45½ for iron, and 42½ for seamless tubes.

Cast Iron Pipe.—No transactions have been closed this week or are pending, except the Minneapolis inquiry for 2,000 tons. Prices are without change, as follows: 4-inch water pipe, $37; 6, 8, 10 and 12-inch, $36; gas pipe, $1 a ton higher.

Wire Products.—The highest record in sales and production for any December was reached by the leading interest last month. The wire trade is wonderously active, and but for the car shortage and steel scarcity would be still more so. Mill stocks are nil, and because of the urgent demand jobbers find it most difficult to keep a full range of material in their warehouses. Prices are very firm, as follows:

Wire nails, $2.15; painted barbed wire, $2.30; galvanized barbed wire, $2.60; smooth annealed wire, $2.30; polished staples, $2.30; galvanized staples, $2.55. Carload lots to retailers, five cents higher; less than carload 15 cents higher.

Rails and Track Supplies.—The inability of railroads to furnish the local rail mill with sufficient cars in which to ship their allotments is seriously interfering with deliveries. The rolling schedule at South Chicago is changed daily to suit the car supply, and congestion and confusion is the result. Demand for spikes and bolts continue brisk. Prices of these are very firm, especially for early shipment. We quote as follows:

Bessemer rails, $28; open - hearth rails, $29; light rails, Bessemer, 30 to 45-pound sections, $33; 25-pound, $34; 20-pound, $35; 16-pound, $36; 12-pound, $37, and lighter sections down to 8-pound, $43.50, all f. o. b. mill. Track supplies vary in price according to quantity and delivery. Angle bars in large lots are quoted 1.65c to 1.75c; for smaller quantities, 2.25c to 2.75c; spikes, large lots, 2.25c; for smaller quantities, 2.50c; bolts, large lots, 2.65c to 2.75c; smaller lots 2.85c with square nuts, and 3c with hexagon nuts.

Sheets.—Rumors continue to circulate that an advance of $2 a ton is imminent. Some have it that the advance will become effective on the first of the year. These reports cannot be corroborated, however. New tonnage and specifications are very heavy, and premiums are paid for early delivery.

We quote carload lots, as follows: Black sheets Nos. 8, 9 and 10, 1.85c Pittsburg; No. 28 gauge, 2.60c Pittsburg. Galvanized sheets No. 28 gauge, 3.65c Pittsburg. Freight to Chicago 16½c per 100 pounds. Jobbers' prices on less than carload lots from store are as follows: Black sheets, No. 10, 2.20c to 2.30c; No. 12, 2.25c to 2.35c; No. 14, 2.30c to 2.40c; No. 16, 2.40c to 2.50c; Nos. 18-20, 2.70c to 2.80c; Nos. 22-24, 2.75c to 2.85c; No. 26, 2.80c to 2.90c; No. 27, 2.85c to 2.95c; No. 28, 2.95c to 3.05c; No. 30, 3.35c. Galvanized sheets, Nos. 10 to 20, 3.25c to 3.35c; Nos. 22 and 24, 3.40c to 3.45c; No. 26, 3.60c to 3.70c; No. 27, 3.80c to 3.90c; No. 28, 4c to 4.10c; No. 30, 5.20c to 5.30c.

Plates.—Buying for late deliveries in 1907 grows apace. Specifications keep their past proportions, and eastern and western mills have all they can roll for several months. Independent manufac-

turers continue to ask from $2 to $4 a ton above the schedule of the leading interest for any delivery this year, and experience no difficulty in getting these prices. Quotations are as follows:

Tank steel, ¼-inch and heavier, up to 100 inches wide, 1.60c to 1.90c, Pittsburg base. For extras see Pittsburg report, Freight rate to Chicago is 16½c per hundred pounds.

Jobbers' prices for shipment from local stocks are as follows: Tank steel ¼ inch and heavier, up to 72 inches wide, 2.10c; 72 inches up to 96 inches wide, 2.20c; 3-10 inch up to and including 60 inches wide, 2.20c; 3-16 inch, 72 inches wide, 2.45c; No. 8, up to 60 inches wide, 2.25c; flange steel, 25c extra; heads, 25c extra.

Coke.—But for the output of the local by-product ovens, Chicago would by this time be in the throes of another coke famine. Shipments from Connellsville and West Virginia regions are deplorably small, and because of the increasing scarcity of cars in those localities are daily becoming less. Spot coke is coming into greater demand, and prices are stiffening. The local market is now firm at a minimum of $4.50 Connellsville ovens, or $7.15 Chicago.

Old Material.—The holidays have interfered with trading in the week under review. Nevertheless there continues a keen desire to unload at least a part of their large stocks by local dealers and prices have not been strengthened by this attitude. There was not enough trading, however, accurately to determine just where the market rested, other than that it is inclined to lower values. Car wheels have been in active demand by the large consuming interests and over 5,000 tons have been disposed of at $25, Chicago.

Old Steel Rails (4 feet and over)	$19.50 to 20.50
Old Steel Rails (less than 4 feet)	19.00 to 19 50
Old Car Wheels	24.75 to 25.50
Old Iron Rails	28.00 to 28 50
Relaying Rails, subject to inspection	29.00 to 30.00
Frogs, Switches and Guards	18.00 to 18.50
Heavy Melting Steel	17.00 to 17.50
Mixed Country Steel	15.00 to 15.50

We quote net tons, as follows:

No. 1 R. R. Wrought	$17.00 to 17.50
No. 2 R. R. Wrought	16.00 to 16 50
Shaft [illegible]	18.50 to 19.00
Dealers' forge No. 1	13.00 to 13.50
Wrought Pipe and Flues	12.50 to 13 00
No. 1 Cast, 150 pounds and less	17.50 to 18.00
No. 1 Mill	10.50 to 11.00
Mixed Busheling (No. 1 & No. 2)	12.00 to 13.50
Country Sheet	9.00 to 9.50
No. 1 Boilers Cut	12.50 to 13.00
Boiler Punchings	16.00 to 16.50
Iron Car Axles	27 00 to 27 50
Steel Car Axles	23.00 to 23.50
Iron Axle Turnings	11.50 to 12.00
Cast Borings	9.00 to 9.50
Mixed Borings, etc.	9 00 to 9 50
Machine Shop Turnings	11.00 to 11.50
Railroad Malleable	17.50 to 18.00
Agricultural Malleable	16.50 to 17.00
Stove Plate and Light Cast Scrap	14.00 to 14.50
Old Iron Splice Bars	22.00 to 22.50

Structural Steel.—New tonnage remains light, but specifications show no diminution. Deliveries are handicapped by the shortage of cars, and local mills are accumulating material on their yards as a result. Prices are firm as follows:

Beams and channels, 3 to 15 inches inclusive, 1.70c Pittsburg. For extras see Pittsburg report. Freight rate from that city to Chicago is 16½c per 100 pounds. Quotations from store are as follows:

All angles, three inches and larger, including six inches, $2.05 to $2.10 per 100 pounds; angles over six inches, $2.15 per 100 pounds base; beams, three inches to 15 inches, inclusive $2.05 to $2.10 per 100 pounds base; channels, three inches and larger, $2.05 per 100 pounds base. Less than carload lots are $2 a ton higher than foregoing prices.

CLEVELAND.

First Foreign Iron Sold in Cleveland Since 1902.—Advance of Steel Rails Price.

Office of THE IRON TRADE REVIEW, Browning Building, Dec. 31.

Iron Ore.—The closing of navigation, with the tying-up of vessels for the winter, and the practical completion of chartering for next season have deprived the local situation of any particular interest. There is a light movement of ore from dock, but this has not yet assumed any large proportions. Eastern furnaces are making little headway in completing ore purchases to fill out their requirements. Nominal quotations at lake Erie dock are as follows: Old Range Bessemer, $5.00; Mesabi Bessemer, $4.75; Old Range non-Bessemer, $4.20; Mesabi non-Bessemer, $4.00.

Pig Iron.—The holiday market has been noteworthy in two particulars. It has witnessed in the first place, the first selling of foreign iron in this city since 1902, and, in the second place, it has been marked by the very general buying by what are commonly considered extremely conservative buyers for third quarter and last half delivery. The importation of British iron to this territory came about through the increased scarcity of spot iron which has reached a stage where practically none was to be had. Spot local iron is selling as high as $26 to $27 Cleveland, whereas No. 3 Middlesborough, which corresponds closely to No. 2 foundry in this country, is procurable at $25.50. So far the tonnage placed in this district has not been heavy, but if it can be obtained, a great deal will be delivered here in the near future to meet the extensive demand for prompt iron. The action of most careful buyers in covering a large part of their last half requirements is significant as a forecast of conditions during the year. For this delivery No. 2 foundry is selling at $22 to $23. Southern foundry No. 2 is being held at $18.50 to $19.00 Birmingham, on which the freight to Cleveland after Feb. 1 will be $4.35. An occasional sale of basic for second quarter at $22 valley furnace is reported and this price is holding good on what selling is being done for later delivery. The second stack of the Toledo Furnace Co. is expected to be ready for blast by the end of the week. Furnace interests in the Mahoning and Shenango valleys enter the new year with an increased cost of producing iron by reason of the 10-cent advance granted employes. For the second quarter we quote, f. o. b. Cleveland, as follows:

Bessemer	$22.35 to 23.35
No. 1 Foundry	23.50 to 24.50
No. 2 Foundry	23.00 to 24.00
No. 3 Foundry	22.50 to 23.50
No. 2 Southern	23.35 to 23.85
Gray Forge	21.00 to 22.00
Lake Superior charcoal	26.00 to 27.00

Coke.—The market is exceedingly firm with the supply of early shipment coke limited. Foundry coke is selling at $4.00 to $4.25 ovens, with furnace at $3.75 to $3.85.

Finished Materials.—An event of unusual interest is the announcement of two large independent interests advancing their prices on Bessemer standard sections to $30 per ton. These companies have booked heavy tonnages for 1907 delivery at the old price of $28, but the increased cost of producing pig iron, with the probability that this will not be diminished to any great extent during the year, is given as reason for the advance. In the case of one producer no deliveries can be made on new orders before August, 1907. The closing days of the year were marked by extremely heavy specifications on old contracts for almost every line of finished materials and scarcely a pound of the tonnage covered remained unspecified for. New contracts are generally for heavier tonnages than during the year just closed. Plates are increasingly firm with deliveries more delayed. Despite the present weakness of scrap bar iron is in brisk demand at 1.90c to 1.95c Cleveland, with jobbers securing 2 cents. The billet market is quiet.

Old Material.—There has been considerable sagging in prices during the past week due to a lull in buying, forcing dealers to dispose of considerable tonnages at shaded prices. The Pennsylvania lines west are out with an extensive list and the Erie is also receiving bids. We quote Cleveland delivery, gross tons in first paragraph, as follows:

Old iron rails	$27.00 to 27.50
Old steel rails (over 6 feet)	20.00 to 20.50
Old steel rails (under 6 feet)	19.00 to 20 00
Old car wheels	21 00 to 21 50
Steel boiler plate	16.00 to 16 50
Steel axles	21.00 to 22 00
Malleable iron (railroad)	19.50 to 20.00
Malleable iron (agricultural)	15.50 to 16.00
Heavy steel	17.50 to 18.00

Country mixed steel	15.50 to 16.00
Low phosphorus	24.00 to 25.00

We quote net tons as follows:

No. 1 R. R. wrought	$18.50 to 19.00
No. 1 busheling	15.50 to 16.00
No. 1 machine cast	19.00 to 19.50
Iron axles	26.00 to 27.00
Axle turnings	14.00 to 14.50
Wrought turnings (free from cast)	12.00 to 12.50
Grate bars	14.50 to 15.00
Pipes and flues	15.00 to 15.50
Tank iron	12.50 to 13.00
Hoop and band iron	9.00 to 9.50
Sheet iron	9.00 to 9.50
Wrought drillings	12.00 to 12.50
Stove plate	14.50 to 15.00
Cast borings	9.50 to 10.00

CINCINNATI.

Financial Conditions and Possibilities. —Market Continues Firm.

December 31.

Pig Iron.—The market continues strong in tone. Prices have been well maintained the past week and while there has been no advance in the general market, some furnaces have advanced their prices for all deliveries. Virginia furnaces have advanced their figures and some Tennessee producers are asking higher prices. The bulk of the inquiry is for delivery in the second half of 1907 and there have been some fair sales, but no very large tonnages are reported in the transactions. The outlook for the new year appears to be very strong. There is nothing reported that would indicate any lessening of consumption and the amount of inquiry for the last half of year supplies indicates a good outlook for finished lines. So far as can be learned, there is no speculative iron sold for the first half of the year and the tonnage on the order books is not of a character that could come out on a dull market as a depressing influence. It is genrally believed that the iron sold for the first half has gone to legitimate users. Warrant yards are reported as practically empty. The only thing in sight that might have an adverse effect on value is the possibility of a prolonged dull spell in the first half of the year which might result in lower prices for the second half. This view is supported by the fact that present values are far above cost lines and this would increase the temptation to the producers to shade prices on a dull market to play safe on some future business. It is taking more money now to handle pig iron than for a long time, and this has a tendency to make sale agencies carry a longer line of credit in the banks, but in case of any disturbance in the money markets, it is believed that furnace interests are in strong position to wait for agencies to make collections. Furnace men view the situation with confidence. It is reported that some southern producers have contracted for a supply of coke for the entire year 1907 at a price which on the usual sliding scale would be equal to $16.85 Birmingham for pig iron.

Northern iron is firm and in southern Ohio prices for the last half of the year range from $21.00 to $22.00 at furnace. Spot northern iron is selling at $25.00 at furnace, but in a limited way. A little second quarter northern iron comes out occasionally at $23.00 at furnace.

Spot southern iron is firm with sales at $23.00 to $23.50 Birmingham. Spot iron delivered Cincinnati is quoted herewith as a basis for settling contracts based on our quotations:

Southern foundry No. 1,	$26.50 to 27.00
Southern foundry No. 2,	26.00 to 26.50
Southern foundry No. 3,	25.50 to 26.00
Southern foundry No. 4,	24.50 to 25.00
Southern fdry. No. 1 soft	26.50 to 27.00
Southern fdry. No. 2 soft	26.00 to 26.50
Gray forge	23.00 to 23.50
Northern foundry No. 1,	26.65 to 27.75
Northern foundry No. 2,	26.15 to 27.15
Northern foundry No. 3,	25.65 to 26.65
Jackson County silvery, 8 per cent	31.15

First quarter iron is quotable at $22.00 to $23.00 Birmingham, second quarter $20.00 Birmingham, third quarter $18.50 to $19.00 Birmingham, and last quarter $18.00 to $18.50. Contracts over the entire last half are made on a compromise between $18.00 and $19.00, Birmingham. We quote for second quarter delivery, delivered Cincinnati, as follows:

Southern Foundry No. 1	$23.50 to 24.00
Southern Foundry No. 2	23.00 to 23.50
Southern Foundry No. 3	22.50 to 23.00
Southern Foundry No. 4	21.50 to 22.00
Southern Foundry No. 1, soft	23.50 to 24.00
Southern Foundry No. 2, soft	23.00 to 23.50
Gray Forge	21.00 to 21.50
Northern Foundry No. 1	24.65 to 25.15
Northern Foundry No. 2	24.15 to 24.65
Northern Foundry No. 3	23.65 to 24.15
Jackson County Silvery, 8 per cent	28.15 to 29.15

Finished Material.—The market continues in satisfactory condition from the standpoint of the jobber and demand from stock is quite good at steady prices. Orders are filled at the following quotations in small lots from stock:

Angles 3 x 3 and over, 2.15c to 2.25c; beams and channels 15 inches and under, 2.15c; small angles and architectural channels, 2.10c base; plates ¼ inch and heavier, 2c; 3-16 inch, 2.10c; No. 8, 2.10c; sheets (blue annealed) No. 10, 2.15c; No. 12, 2.20c; No. 14, 2.25c; No. 16, 2.35c; box annealed sheets Nos. 18 and 20, 2.50c; Nos. 22 and 24, 2.60c; Nos. 25 and 26, 2.65c; No. 27, 2.70c, and No. 28, 2.80c. Iron and steel bars, 1.95c base; boiler tubes, 6 per cent off base; turn buckle 45 per cent off; rivets, 3.15c base; cold rolled shafting 45 per cent off list; steel tire, 2.10c base.

Coke.—The market is firm with some contracting for next year's supplies. Deliveries on contracts have not improved and consumers are calling for belated deliveries. Prices in the leading coke producing districts are as follows:

Wise County, Va. Furnace Coke prompt shipment	$3.50 to 3.75 per ton
Wise County, Va. Foundry Coke	4.00 to 4.50 per ton
Pocahontas Furnace Coke prompt shipment	3.25 to 3.50 per ton
Pocahontas Foundry Coke	3.80 to 4.00 per ton
Connellsville Furnace Coke prompt shipment	3.25 to 3.50 per ton
Connellsville Foundry Coke	4.15 to 4.50 per ton
New River Foundry Coke on contracts	3.50 to 4.00 per ton
New River Furnace Coke, prompt shipment	2.75 to 3.00 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.70 to $1.75 per ton on $9.00 pig iron, plus 19 to 20 per cent of the advance on pig iron above $9.00 Birmingham.

Old Material.—The market is steady with a fair inquiry, but no change in prices. We quote dealers' prices at Cincinnati:

Old No. 1 railroad wrought, net tons	$18.50 to 19.00
Cast machine and foundry, net tons	18.50 to 19.00
Old iron rails, gross tons	26.00 to 27.00
Old steel rails, gross tons	19.00 to 20.00
Old short lengths, gross tons	19.00 to 20.00
Old iron axles, net tons	26.00 to 27.00
Heavy melting scrap, gross ton	20.00 to 21.00
Stove plate, net tons	14.00 to 14.50
Wrought turnings, net tons	12.50 to 13.00
Cast borings, net tons	9.00 to 9.50
Car wheels, gross tons	21.50 to 22.00

BIRMINGHAM.

Railroads Plan for Better Service.— Heavy Demand for Pig Iron.

January 1.

Another spurt in the demand for pig iron is expected in the Birmingham district in the next few days, inquiries received before the holiday season set in indicating that there is need for a large quantity of iron. The furnace companies in this district are not in a position to handle much business save for delivery during the second half of the year. The entire probable make for the first quarter of the year has been sold and more than 75 per cent of the make for the second quarter has been disposed of also. The accumulated stocks of iron on the yards today are greater than they have been at any time in three years. It is estimated that 50,000 tons of iron at least could be gotten together within twenty-four hours in this district. The railroad situation as regards cars with which to haul the product is still in a bad way. There are prospects of some improvement in the transportation facilities by dividing up divisions in this neighborhood, three superintendents being put on by the Southern railway where heretofore one man has been doing the work. It is expected that with less territory to look after, these superintendents will make some improvement in the service.

Iron for delivery during the last half of the year is quoted at $17.50 to $19 per ton. A statement is made that very little of the product is being sold under $18 per ton. There is no spot iron being sold at this time, as far as can be learned.

PHILADELPHIA.

Advance of 36 Per Cent in Pig Iron Prices During the Past Busy Year.

January 1.

Pig Iron.—The new year starts out most buoyantly, and the market shows no weakening under either the usual slackening up incident to the holidays or the heavy purchases made for the last half of the year. Indeed there has been a distinct strengthening in the price of basic, the heavy sales of which have been such a notable feature of the past fortnight. Much of this has been taken for a large interest that lately got into operation near New York City, and the purchases were made from a number of furnaces. Under this stimulus, basic has risen to $23.50 to $24 for the last half, which for the first and second quarters a considerable premium must be paid. Foundry iron continues in active demand, and the reports of heavy consumption which come from all sides indicate that there is to be no relaxation in prices for a long time. In this connection, as showing the marked prosperity of the year which has just closed, it is interesting to reproduce the following average monthly prices of No. 2X for prompt delivery in this city during 1906, compiled by Secretary James M. Swank, of the American Iron and Steel Association:

Months.	Price.
January	$18.50
February	18.50
March	18.35
April	18.62
May	18.81
June	18.56
July	18.50
August	19.15
September	21.75
October	22.69
November	23.80
December	25.00

This shows an advance of $6.50, or 36 per cent during the year. Incidentally it may be remarked many prompt deliveries of No. 2X during December were very much higher than $25. There are well authenticated cases of consumers pressed by orders paying $27 or $28 for spot iron—a figure which brings the increase for the year up to 50 per cent.

In commenting on the remarkable features of 1906, too much importance cannot be placed upon the wonderful benefit, especially to consumers in eastern territory, of the importations of English and Scotch iron. It is not too much to say that but for these shipments, which continue to arrive weekly, the market would have assumed a runaway character that might have proved very serious. As things have worked out, many thousands of tons of this foreign iron have been deposited in carload lots to small consumers and have enabled them to keep their plants going when domestic furnaces failed in their deliveries. Orders placed abroad insure a supply of not far from 100,000 tons between this date and April 1 and are found to prove of immense value if severe winter weather should seriously check deliveries from home furnaces. Prices for Middlesborough No. 1 are now quoted at $23.50 at dock, and No. 3 at $23, while Scotch iron cannot be had under from $24.50 to $25. With the exception of basic prices remain as given last week and maybe quoted as follows:

No. 1X Foundry	$26.00 to 26.75
No. 2X Foundry	23.75 to 24.75
No. 2 Plain	23.25 to 23.75
Standard Gray Forge	22.00 to 22.50
Basic	23.50 to 24.00
Low Phosphorus	27.00 to 28.00

New Material.—It seems hardly necessary to repeat the statement that business is excellent in all lines. Too many orders are now pressing on the mills that premiums are being asked, especially for plates, on which three to four months are now asked for deliveries. It is said that the mills begin the new year with more orders booked than ever before. Prices remain substantially unchanged as follows:

Beams, channels and angles according to specifications, 1.83½c to 2c; refined iron bars, 1.89½c to 1.93½c; steel bars, 183.½c to 1.88½c; plates, 2.03½c to 2.08½c.

NEW YORK.

Better Delivery of Pig Iron.—Some Foreign Metal to Spare for Future Demand.

Office of THE IRON TRADE REVIEW.
ROOM 1315, No. 150 NASSAU ST., Dec 31.

Pig Iron.—Buying for delivery during the last half of the year is proceeding at a remarkable rate, considering the high prices and the length of time before shipment. One of the chief sellers in New York anounces that December has been the largest as regards tonnage in the history of his office and that practically all sales were for last half delivery. The bulk of the business has been as usual in this market in foundry grades. There were also considerable sales of basic and gray forge.

Purchases of foundry grades for nearby shipment have fallen off, partly because there was little iron of this description to be had, but also because shipments have improved, relieving the dread of being caught in a pinch rather than yielding any surplus of metal. For this reason there has been less demand for foreign iron. Some Scotch and English pig is going into storage, awaiting higher prices and a more active demand. Few of the local agents can offer any iron for early delivery. One even reports that he has not a ton for delivery before August.

The following are prices of pig iron at tidewater:

Northern Foundry No. 1	$24.00 to 26.00
No. 2 Foundry	23.50 to 25.50
No. 2 Plain	23.00 to 25.00
No. 1 Southern Foundry	23.50 to 27.00
No. 2 Southern Foundry	23.00 to 25.50
No. 3 Southern Foundry	22.00 to 24.00
No. 4 Southern Foundry	21.50 to 23.00

Finished Iron and Steel.—The steel market has shown the effects of the holiday season. Very little new business of any kind appeared and most of the offices are busy with the end of year accounts. About the most interesting developments of the week was the placing of a lot of new orders for steel cars, orders which will involve some 40,000 tons of various steel products.

The following are prices at tidewater: Angles 3 to 6 inches x ¼ inch and heavier, 1.84½c; beams, 3 to 15 inches, 1.84½c; tees, 3 x ¼ inch and heavier, 1.89½c; plates, carloads. tank, 1.94½c to 2.14½c; flange, 1.94½c to 2.14½c; marine boiler, 2.41½c; refined iron bars, 1.84½c to 1.89½c; soft steel bars, 1.74½c to 1.84c; sheets, No. 28 black, 2.60c.

Old Material.—There has been no great activity during the week due in part to the holiday season. Prices are, however, fairly steady. Cast scrap remains in good demand with supplies far from plentiful. There were a few sales of heavy steel and wrought scrap. The following are prices approximately f. o. b. tidewater:

Old iron rails	$25.00 to 25.50
Old steel rails, long lengths	17.50 to 18.50
Old steel rails, short pieces	16.50 to 17.50
Relaying rails	26.00 to 27.00
Old car wheels	21.00 to 23.00
Old iron car axles	29.00 to 30.00
Old steel car axles	21.00 to 21.50
Heavy melting steel scrap	18.00 to 18.50
No. 1 railroad wrought scrap	20.00 to 20.50
Iron track scrap	18.00 to 19.00
Wrought pipe	14.50 to 15.00
Cast borings	11.00 to 11.50
Wrought turnings	15.25 to 15.75
Heavy Cast Scrap	19.00 to 21.00

ST. LOUIS.

Inquiry Heavy for Last Half Iron.—Much Structural Work.

January 1.

Pig Iron.—Last half inquiries are improving daily and sales for that period

are becoming more common. There is still a graded scale of prices, but the lowest figure is high enough to afford ample profit to the furnaces. January commands $23.50, February and March, $22.50, second quarter, $19.50 and last half, $18.50. The American Steel Foundries are in the market for a good round tonnage of basic. They placed one order for 6,000 tons.

Quotations for the first quarter, including the freight rate from Birmingham, are as follows:

Southern No. 1	$27.00 to 27.50
Southern No. 2	26.50 to 27.00
Southern No. 3	26.00 to 26.50
Southern No. 4	25.50 to 26.00
Gray Forge	25.00 to 25.50

BUFFALO.

Interesting Developments of the Year. Large Increase in Consumption.

December 31.

Pig Iron.—Trade has been dull throughout the week, the holidays causing a slight indifference to the market, but prices remain firm and the quotations of the preceding week have not changed. There has been some activity in foreign iron and a number of good sales are reported as being made for prompt delivery. Inquiry for iron for last half of 1907 continues strong and there seems to be no let-up in the uneasiness of consumers, who fear that they may not be able to get all the iron they want for the latter part of the year.

This year the pig iron trade in Buffalo districts has seen interesting developments, some of which are very encouraging to producers. Chief among them is the increase of consumption. This has been steady and certain and does not include the Lackawanna steel plant, which produces largely for its own consumption. But the increase has been general and very satisfactory. The leading pig iron men here represent that this increase is at least 25 per cent over that of 1905. Producers look forward to a year of satisfactory results. They foresee brisk business and realize the urgency of quick production. During the early part of the year the furnaces did not produce at full capacity and this, it is said, was due to an unusual amount of humidity in the atmosphere of this territory during the early part of the summer. This always retards the furnaces. Since winter set in, the furnaces have been working splendidly, turning out the full quota of pig iron and of a fine quality.

Buffalo furnaces did not reduce prices in 1906 when the southern furnaces came into the market with a reduction of one dollar a ton. On the other hand, they promptly advanced their prices, which they were obliged to do when signs of an iron famine in this district became unmistakable. In May the furnace operators of this district found themselves in a somewhat dull period of trade and then, to make the market more erratic, consumers rushed in with big orders for first quarter of 1907, and there was a period of more than a month that the market was in a very unsettled condition. In fact, this condition continues to some extent, but the close of the year showed indications of improvement.

It is observed by local men that consumers are getting more analytical in their demands. They are making finer classifications in the grades of iron they wish to purchase. This has grown to be an important factor in the local market and, strangely enough, has come about within the past year. It has forced the furnaces to make finer distinctions between the grades of iron they produce. This condition is believed to be largely due to the nature of the Buffalo manufacturing industry, which certainly calls for a great variety of iron to meet the needs of the manufacturers.

With the construction of many new iron and steel manufacturing plants in this district this year, the pig iron market will be greatly increased and it is certain that it will take all the local furnaces can turn out, as well as the production of furnaces now under construction, to supply the demand. We quote for last half delivery:

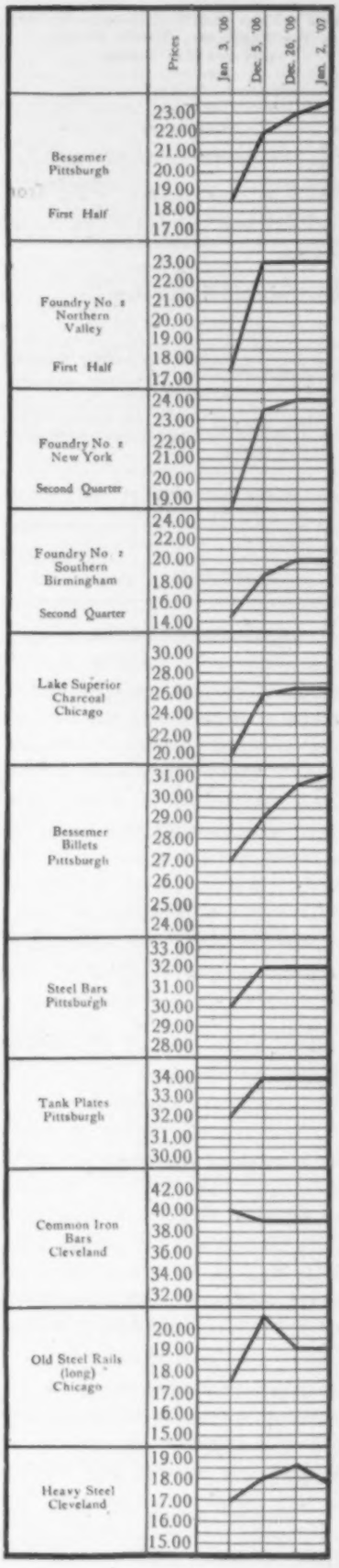
No. 2 Plain Foundry	$22.00 to 23.00
No. 2 X Foundry	22.50 to 23.00
No. 3 Foundry	22.00 to 23.00
Malleable Bessemer	23.00 to 23.50
Gray Forge	21.50 to 22.00
Charcoal	25.00 to 26.00

Watson G. Moody, for fifteen years resident manager of the Boston office of Rogers, Brown & Co., died Dec. 21, at Idlewild, Rye, Colo., where he had gone some time ago for his health. He possessed a large circle of business and social friends, particularly in the New England states, where he was held in high esteem. His wife and two children, who survive, will remain at Rye, Colo., indefinitely.

Edwin G. Crawford, vice president of the Carondelet Foundry Co., St. Louis, died Dec. 19, of pneumonia, aged 51 years. Mr. Crawford was born in Madison, Ind., and had been engaged in the foundry business for 30 years, having been connected at various times with the National Malleable Iron Co. of Indianapolis, the Indianapolis Foundry Co. and for the past 17 years with the Carondelet Foundry Co.

W. W. Adams, formerly connected with the Aerocar Co., Cleveland, has accepted the position of manager of the Pittsburg office of the Browning Engineering Co., Cleveland, and will be located at 1103 House building, Pittsburg.

PRICE CHART.


Prices
Jan. 3, '06
Dec. 5, '06
Dec. 26, '06
Jan. 2, '07
Bessemer Pittsburgh First Half
23.00 22.00 21.00 20.00 19.00 18.00 17.00
Foundry No. 2 Northern Valley First Half
23.00 22.00 21.00 20.00 19.00 18.00 17.00
Foundry No. 2 New York Second Quarter
24.00 23.00 22.00 21.00 20.00 19.00
Foundry No. 2 Southern Birmingham Second Quarter
24.00 22.00 20.00 18.00 16.00 14.00
Lake Superior Charcoal Chicago
30.00 28.00 26.00 24.00 22.00 20.00
Bessemer Billets Pittsburgh
31.00 30.00 29.00 28.00 27.00 26.00 25.00 24.00
Steel Bars Pittsburgh
33.00 32.00 31.00 30.00 29.00 28.00
Tank Plates Pittsburgh
34.00 33.00 32.00 31.00 30.00
Common Iron Bars Cleveland
42.00 40.00 38.00 36.00 34.00 32.00
Old Steel Rails (long) Chicago
20.00 19.00 18.00 17.00 16.00 15.00
Heavy Steel Cleveland
19.00 18.00 17.00 16.00 15.00

THE IRON TRADE REVIEW

Devoted to Iron and Steel Manufacture and to the Machinery, Metal-Working and Foundry Trades.

PUBLISHED EVERY THURSDAY BY
THE PENTON PUBLISHING CO.
CLEVELAND

BOSTON DULUTH
CHICAGO NEW YORK
CINCINNATI PHILADELPHIA
PITTSBURG

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Advertising Rates Furnished on Application.

Change of advertising copy must reach this office ten days preceding date of publication.

The Cleveland News Co., will supply THE IRON TRADE REVIEW through the regular channels of the American News Co.

European Agents: The International News Company, Breams Building, Chancery Lane, London, E. C., England.

ENTERED AT THE POST OFFICE AT CLEVELAND, AS SECOND CLASS MATTER

PRINTED IN AN OPEN SHOP

JANUARY 3, 1907.

ANNOUNCEMENT.

A. O. Backert, for a number of years in charge of the Pittsburg office of THE IRON TRADE REVIEW, and for the past two years western editor of *The Iron Age*, with headquarters at Chicago, has accepted the position of editor of the *Foundry* and associate editor of THE IRON TRADE REVIEW.

B. S. Stephenson, associate editor of THE IRON TRADE REVIEW at the Cleveland office, will be placed in charge of the news department of the New York office February 1.

A PETITION'S FALSE CHARGES.

Certain manufacturers of agricultural implements have forwarded to President Roosevelt a petition in which some astonishing statements are made. Although the document contains about 1,400 words, it is strangely lacking in definite charges. For example, a great deal is said about "trusts" and the "present steel and pig iron combination," but it is impossible to determine whether the Steel Corporation, or some other concern is referred to.

"We are," says the petition, "compelled to buy wholly and entirely our iron and steel material and supplies from the present steel and pig iron combination." As the United States Steel Corporation produces less than 50 per cent of the pig iron manufactured in the United States, and only about 60 per cent of the steel ingots and castings, and 47 per cent of finished rolled products, and as there is no company or combination so large as the Steel Corporation, the assertion of the petition is false.

The petition further charges that "the prices at which we are forced to buy are being continually manipulated by curtailing the output; shutting down of furnaces; precipitating strikes and privately handling purchases and deliveries of railway equipment and many other conveniently controlled and unjust causes, so that the pig iron usually bought at from $8.00 to $14.00 is now costing us at least $22.00 Birmingham." Although the tariff and the "trust" are blamed for all this, the author of the petition forgets that the pig iron of the south is manufactured entirely by independent interests. To say that any of these interests are shutting down furnaces, precipitating strikes or in any other way curtailing the output, is so absurd that no one having the slightest information on the subject could be deceived by it. The well-known truth is that the price has advanced in harmony with the law of supply and demand, and that every furnace in the south is turning out pig iron as fast as it can possibly do so.

"In recent years," continues the petition, "we have been able to order our stock one month and to expect delivery of the material the month following, but now we are required to order six, eight and ten months, and even longer, ahead." It is, of course, true, that in a time of prosperity like the present it is necessary to buy far in advance, whereas, in the soup house days of our last low tariff, deliveries could be given very promptly. It is not our purpose at this time to enter into a general discussion of the tariff, but it does seem to us that before making such sweeping, and in some cases absolutely false statements as characterize the petition recently forwarded to the president, the agricultural implement manufacturers would do well to consider more carefully the possible effect of free trade upon their interests, or at least be more careful in ascertaining facts.

After making numerous charges in a general way as to "arbitrary ideas, exactions, etc.," the petition declares that if the manufacturers were to advance prices upon their machines to offset the increased cost of iron and steel, the farmer would "refuse to buy, preferring to rely upon the doing of this work by old and crude methods, until modern machinery can be produced at a price he has learned to look upon as reasonable." The fact is that the cost of hardware and farm implements has been steadily advancing, and that in spite of this fact, the farmers, who are more prosperous than ever before in the history of the country, are buying freely and will continue to do so. There certainly is no reason for apprehending that the farmers will go back to wooden plows because the price of the modern plow has been advanced. When the farmer is prosperous, he is willing to pay a fair price for his implements, and if there is any one who has a reason to be satisfied with present conditions, it is the farmer. We do not believe that he is ready to indorse the attack upon the present tariff system which has been made by a few manufacturers in a petition which shows either gross ignorance or willful intention to mislead.

EXTENT OF THE "HILL" ORE LANDS.

Nowhere else in the world can one find a class of men so swayed by impulse as those who go to make up what is popularly known as Wall street. Nowhere else does the old maxim "The wish is father to the thought" have such undisputed sway. The less Wall street is in position to know of a subject the more cheerfully and confidently does it give out its pronunciamentos.

These sociological facts have been particularly observable in the matter of Lake Superior iron ores. When the United States Steel Corporation was formed, its securities became a favorite. Wall street at once discovered how many tons of iron ore the Steel Corporation controlled, and the total number of tons exisiting in the Lake Superior region. There was a difference, necessarily, in the two quanti-

ties, but that difference was made as small as possible and was grudgingly given to the outsiders.

Times change, and, unreasonably, the Steel Corporation securities became the shuttlecock of Wall street. Times changed again, and they became anew a favorite. Then a new element was injected. Certain lands, containing an uncertain quantity of ore, were leased by the Great Northern Railway Co. and associated interests, to the United States Steel Corporation. Both lessor and lessee were entitled, as Wall street affairs go, to the most distinguished consideration. That consideration has been shown by increasingly inflated estimates of the tonnage of ore leased to the Steel Corporation, and of the returns to the Lake Superior Co., arising out of both the prior and present leases.

Diffidently it was reported in Wall street, when the summer was almost over, that the ore lands leased to the Steel Corporation might contain between 300,000,000 and 500,000,000 tons of ore. When the thermometers on the Mesabi rage were hovering around the zero mark, Wall street suddenly learned that through "explorations made since," Mr. Hill had become "convinced" that the lands contained 750,000,000 tons. For such Wall street operations "all place a temple and all season a summer." Men on the Mesabi range know that no such explorations have been "made since" or could have been made. In any case it would now be the Steel Corporation doing the exploring. The amount of ore actually proved up on the Hill lands not including that already being mined under prior leases, falls far short of 100,000,000 tons. In short the great majority of the lands just transferred, have not been explored. Statements of the amount of ore contained are guesses, and any guess at as much as 400,000,000 tons is an extravagant one. Of course it is a possibility, but it is an extremely improbable one, that more than half a billion tons of ore will ultimately be found on these lands. The probabilities are much more distinct that the amount will run under 400,000,00 tons.

Still more absurd are the estimates which have been circulated in Wall street as to the present revenue of the Lake Superior Co., through the leases prior to the great one to the United States Steel Corporation. It was stated some time ago that this revenue amounted to about $4,000,000, and one of the Wall street publications which first circulated the statement has since stated, although admitting that the original statement had been doubted and denied, that the present earnings are well in excess of $3,000,000.

In view of the simple arithmetical fact that this revenue is the product of royalty per ton by tons mined, no such delusion should be entertained for a moment. There is an infinite number of pairs of factors, which, multiplied together, will produce $4,000,000. For instance, 4,700,000 and 0.85 will do the trick, approximately, as will also 20,000,000 and 0.20. In the first case these prior leases would involve the mining of 4,700,000 tons a year, a quantity greatly in excess of the fact, and would involve the paying of a royalty of 85 cents a ton, a rate quite undreamed of when these leases were made, several years ago In the second case there would be involved the payment of a royalty of 20 cents a ton, which is in excess of the fact, but there would also be involved the mining of 20,000,000 tons, a quantity equal to the entire output of the Mesabi range in 1905, and more than five-sixths of its output in 1906.

These arithmetical considerations should have appealed to Wall street. The ore trade, however, rejoices in actual facts. These facts are fairly well known, to the effect that the prior leases in question involve the Stevenson, Mahoning and Kinney mines. Mahoning and Stevenson did a million tons each in 1906, and will do about the same in 1907. Kinney did 100,000 tons in 1906, but its owner, the Republic Iron & Steel Co. expects to get 400,000 tons out in 1907. The Stevenson and Mahoning leases are understood to be on a sliding scale, averaging 15 cents, or thereabouts, and the Kinney lease at 18 cents. These were regular market rates at the time, considering all factors. The income in 1907, therefore, of the Lake Superior Co., from prior leases, will be about $372,000, and not $3,000,000 or $4,000,000.

Rarely has Wall street gone so mad on anything as on these ore certificates. The public is informed that the subject is much discussed in Wall street whether it is better for the Steel Corporation to mine these ores quickly or slowly, in view of the fact that the rate of royalty increases by 3.4 cents a year, or 4 per cent on the original rate of 85 cents, and it is stated as the result of profound deliberations (on the part of Wall street --not on the part of the Steel Corporation) that it has been found to be better for the Corporation to mine the ores quickly.

O tempora! To what pass has this once prosperous steel manufacturing trade come, that it will pay the Steel Corporation better to put up 85 cents in royalty, leaving its own ores owned in fee, lie in the ground, to save 4 per cent simple interest, than to invest the 85 cents in steel plants! Furthermore, the minimums cannot be mined in the near future for engineering reasons

It is unfortunate that the iron trade, with its great ramifications, has become mixed up in Wall street. Changes in the general condition are watched daily by hundreds of thousands of business men, who have neither the time nor opportunity to familiarize themselves with the details of the movements, but who are vitally interested in the results. A decline in iron and steel securities on the stock exchanges forbodes evil to these men, who are in no position to analyze causes, but who must be affected by the results. By the absurd means which have here been referred to, a stock market value is sought to be given to these Great Northern ore certificates which they do not possess, and when the sad enlightenment comes, there will be a decline which will be more or less felt throughout the fabric of the iron and steel consuming trade.

ELECTRIC TRAVELING SLAG CRANES.

In keeping with the requirements of modern blast furnace equipment, the electric traveling crane has been especially designed for the rapid and economical handling of the slag where it is converted from the molten state into a granulated form, and to supersede the older and familiar method of transporting in ladles on cars to some convenient dumping ground, what was formerly considered waste product.

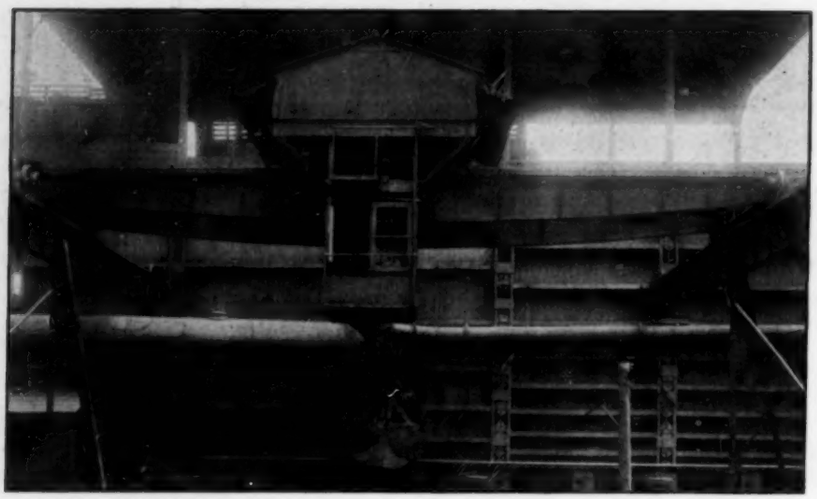


FIG. 1.—SLAG CINDER HANDLING CRANE AT WHARTON BLAST FURNACES.

At the Wharton blast furnaces, Wharton, N. J., two three-cubic yard slag cinder handling electric traveling cranes, built by Pawling & Harnischfeger, Milwaukee, Wis., have but recently been placed in service, the installations being reproduced in Figs. 1, 2 and 3. The cranes are three-motor drive, one being 49 feet 10 inches span and 27 feet 6 inches lift serving No. 2 furnace, shown in Figs. 1 and 2; the other one, Fig. 3, is 34 feet span and 46 feet 9 inches lift for No. 3 furnace.

The bridge and trolley operating parts are the same as are usually employed in regular crane practice. The distinguishing features are the clam-shell buckets and the mechanism for operating them and handling the loads. The buckets have three cubic yards capacity, the shells being made in halves supported from the cast steel brackets that are trunnioned on the same shaft on which the bucket cable drum revolves.

Fig. 4 is a top view of the crane illustrated in Fig. 3 and shows the trolley and mechanism with the housing removed. The drum with the grooving in the center is termed the hoisting drum, the dumping drum being grooved at the ends. In this view can be seen the operating parts connected to levers in the cage for operating the friction clutch band brake as described below.

The trolleys are 12 feet 6 inches by 11 feet 6 inches by 7 feet high to the top of the housings. The frames are cast iron trolley sides with structural steel end girts extended at one end about seven feet to support the operator's cage. In the trolley sides the truck wheels are located, also the drum shaft and main pinion bearings. To the hoist motor is coupled a slip friction coupling that connects through three sets of gears and pinions to the drum shafts. In this chain of gearing is incorporated the mechanical load brake.

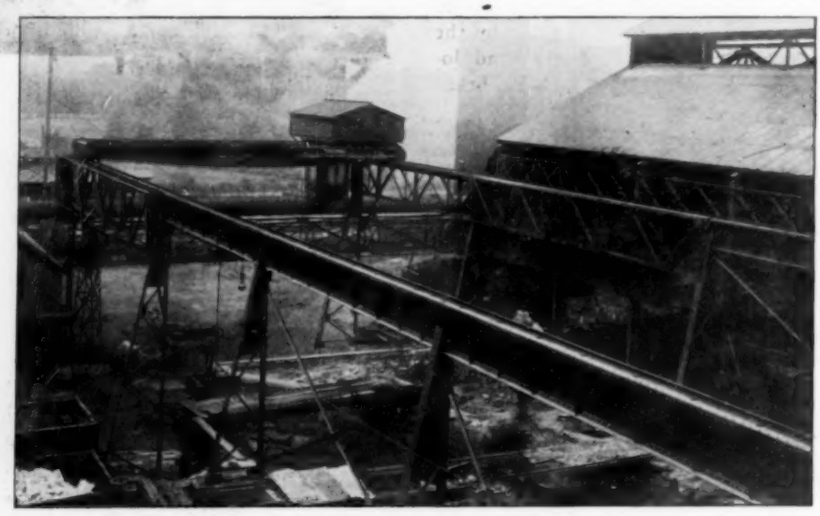


FIG. 2.—SLAG CINDER HANDLING CRANE AT WHARTON BLAST FURNACES

To the hoisting drum, which runs free on its shaft, is fitted a very substantial friction clutch. The clutch rim is bolted to the drum flange, the clutch center being keyed to the shaft. Wood blocks fastened to the clutch ring are expanded to grip on the clutch rim, by a wedge action applied through a system of levers and bell crank to the clutch lever in the cage. The dumping drum also runs free on the shaft, but is made to revolve with the shaft by a permanent friction coupling fitted in the end of the drum. At the same end and on the outside is the band brake that is also operated from the cage, but by a foot lever.

These cranes are operated continuously day and night and under very trying conditions. In running off a heat the molten iron is conveyed through troughs to large ladles for pouring, the slag being skimmed off and run to the large reservoirs where, as it leaves the troughs, it is converted into granulated form by coming in contact with a stream of water emerging from a large pipe immediately under the trough. This creates a mass of vapor, which heated as it is, carries sulphurous gas and minute particles of slag. Despite the fact that the cranes are enveloped in this cloud of vapor which obstructs the view of the bucket and slag pit, the operation is conducted with remarkable precision and speed. This is made possible through the medium of the indicators in the operator's cage which at all times indicate the exact location of the bucket and crane in relation to the slag pit and cars.

The operation is very simple, being governed by three controllers (hoisting, bridge and trolley), one clutch lever and one foot brake. To open the bucket the hoisting drum clutch is released while the foot brake is ap-

plied to the dumping drum. The bucket jaws being trunnioned at the center and held at the corners, their weight forces them to open, the operator checking the hoisting drum when the bucket has opened. To lower the bucket the foot brake is released from the dumping drum, the weight of the bucket carrying it down into the slag. By again applying the hoisting drum clutch and starting the hoist motor the bucket closes over and hoists the load of slag cinder and is raised to the required height as indicated by the gauges. The load is carried and located over the cars, the foot brake applied, the hoisting drum clutch released and the load is dumped.

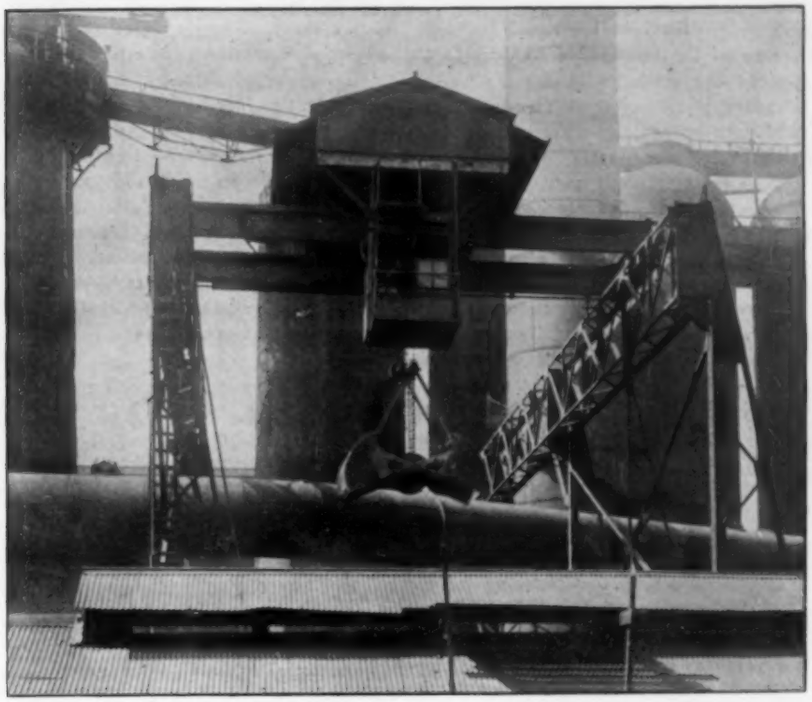


FIG. 3.—SLAG CINDER HANDLING CRANE AT WHARTON BLAST FURNACES.

The cranes are of great value as time and labor savers as compared with the old method. The cinder product is readily disposed of for grading purposes, railroad ballast and for concrete.

CORLISS ENGINE BUILDERS.

The Society of Corliss Engine Manufacturers of America was organized at a meeting of Corliss engine builders held recently at Philadelphia. The aim of the organization is to secure the cooperation of builders in putting out Corliss engines of better quality and the practicing of greater economies in their manufacture. A feature of the work of the new body will be the promotion of a more uniform specification and design. The practice now is for engine builders to bid on specifications submitted to them. The idea is to build according to their own specifications, which will be as nearly uniform as the various styles of engines will permit.

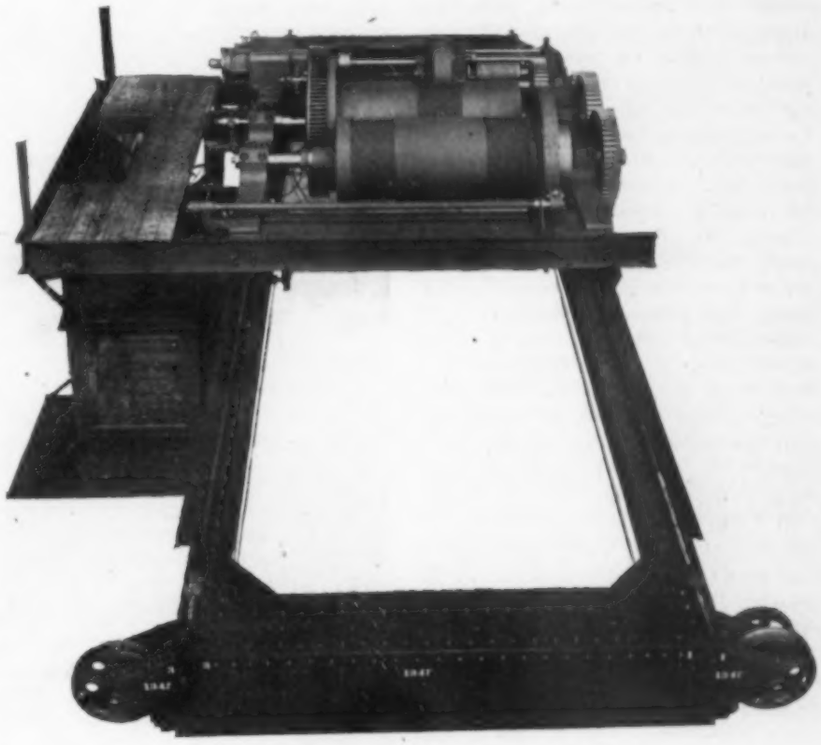


FIG. 4.—TOP VIEW OF CRANE SHOWN IN FIG. 3.

The society has the following officers: President, J. J. Record, president of the Minneapolis Steel & Foundry Co., Minneapolis, Minn.; vice presidents, W. E. Dodds, general manager of the Allis-Chalmers Co., Milwaukee, Wis., and Gardner C. Simms, president of the William A. Harris Steam Engine Co., Providence, R. I.; treasurer, J. C. Hooven, president of the Hooven, Owens & Rentschler Co., Hamilton, O. The officers and F. L. Faitchild, of the C. & G. Cooper Co., Mt. Vernon O.; James Brooks, president of the Southwark Foundry & Machine Co., Philadelphia, and L. W. O'Neil, of the Fulton Iron Works, St. Louis, Mo., constitute the board of directors.

STIRLING BOILER CHANGES.

A confirmation of the report that the Stirling Boiler Co., of Barberton, O., has been acquired by the Babcock & Wilcox Co., a New Jersey corporation, thus merging the two largest boiler companies in the world, has been made in the changing of the official name of the Stirling Co. to that of the Babcock & Wilcox Co., Stirling department. It is stated that General Manager J. P. Snedden, of the Stirling plant, will take charge of the main office in New York. Isaac Harter, who has been Mr. Snedden's assistant, will succeed to the Barberton management. The Babcock & Wilcox Co. acquired the eastern companies about a year ago; at the same time the Stirling Co. absorbed the Aultman & Taylor Co., of Mansfield, O. The latter plant is to be removed to Barberton.

IMMENSE EXPENDITURE OF RAILROADS IN 1906.

A wonderful story of the effort American railroads are making to handle the flood of traffic which for so many months has threatened to overwhelm them, is told by the statistics of railway construction in the United States in 1906, says the *Railway Age*. An expenditure of nearly three-quarters of a billion dollars is shown by the construction of 6,000 miles of new railway and in orders placed during the year for 3,400 passenger cars, 5,650 locomotives and 310,000 freight cars. In freight car construction these figures show that the railroads have done more than was reasonably to be expected to provide themselves with equipment for relieving the wide-spread anxiety aroused by the freight congestion and car shortage.

In 1905 the American railways, including those of Canada and Mexico, placed orders for 341,315 freight cars. Of this grand total 38,439 cars were ordered from railway shops in the United States, Canada and Mexico, leaving a balance of 302,876 cars, which were purchased from the contract shops of the United States in that year.

Car Orders Heavy.

In 1906 of the grand total of 310,805 freight cars ordered, 51,939 cars came from American, Canadian and Mexican railway shops; the remainder, 258,866 cars, was ordered from the contract builders of the United States. It is estimated that the present capacity of the car-building establishments of the country is about 200,000 freight cars a year. In 1905 the contract shop output was 175,000 cars. Recent extended improvements indicate that the 1907 capacity will be approximately 250,000 cars. It is stated that already two-thirds of the output of the ensuing year, or about 170,000 cars, is already taken up. This will mean that the car-building plants will be engaged on the orders now on hand until Sept. 1, 1907. If at the beginning of 1905 the car builders had cleaned up their 1904 orders, the following situation would have prevailed in the car construction industry at the beginning of 1907:

Plant Capacity.

1905	175,000
1906	200,000
1907 (8 months)	170,000
Total	545,000

Contract Shop Orders.

1905	302,876
1906	258,866
Total	561,742

This shows that the railroads for the past two years, at least, have discounted by six to twelve months the freight car producing capacity of the country.

Steel in Demand.

One of the remarkable features in the freight car statistics is the tremendous increase in the demand for steel cars and cars with steel underframes It is estimated that 142,172 or 46 per cent of the grand total of freight cars ordered during the year, were specified to be of steel or to have steel underframes, a gain of about 400 per cent as compared with 1901. For passenger service the use of fire-proof steel cars is growing rapidly, as cars of this class are now generally regarded as essential in tunnels and subways. The first sleeping car to be absolutely fire-proof has about been completed by the Pullman Co. Steel passenger cars are now being erected by the Union Pacific and the Southern Pacific, and other car constructors have prepared their plants to accept contracts for this kind.

The locomotive orders placed during 1906, while 623 engines less than 1905, show a great demand for power, and the year has been notable in the development of locomotive types which have great power and weight combined Electric locomotives for heavy haul will be introduced during the coming year by the New York Central and New Haven roads. This innovation in railway power may have some bearing on the orders for steam locomotives in the future. During the past six years the figures compiled on railway equipment orders show the following:

	Locom.	Pass. Cars.	Freight Cars.
1901	4,340	2,879	193,439
1902	4,665	3,459	195,248
1903	3,283	2,310	108,936
1904	2,538	2,213	136,561
1905	6,265	3,289	341,315
1906	5,642	3,402	310,805

The passenger car demand is shown to be larger than last year, and the largest for any year since 1902, when anticipation of heavy traffic during the St. Louis world's fair brought about extensive orders generally.

Splendid Track Record.

The best record in 18 years is shown by the track construction in 1906, yet this is not an adequate expression of the real activity in new railway construction. Only completed track and not grading and other important construction work is included in the figures, which show 6,067.4 miles of new rails laid. Extensive plans now under way, which will increase the mileage in the northwestern part of the United States and Canada, do not appear in these figures. The great industrial development of the west is shown by the track building in 1906, as the new mileage is greatest in the southwest, west and northwest. Texas leads all states in new track with 701 miles, Louisiana and South Dakota are almost equal for second place with 391 and 389 miles respectively. The other leading states range in this order: Nevada 360, Arkansas 240, North Dakota 228, Wisconsin 220, Wyoming 214 and California 211. Almost one-half of the nation's total for the year, or 2,954 miles, was built in these nine states. By groups of states the construction is as follows:

	Miles.
New England	46.61
Middle	196.70
Central Northern	493.24
South Atlantic	804.40
Gulf and Mississippi Valley	728.32
Southwestern	1,518.43
Northwestern	1,130.69
Pacific	1,149.03

Totals for 20 Years.

Since the record year for the United States in construction, 1887, the total track building for the past 20 years is as follows:

Year.	Miles.
1887	12,983
1888	7,106
1889	5,230
1890	5,670
1891	4,281
1892	4,192
1893	2,635
1894	1,949
1895	1,803
1896	1,848
1897	1,880
1898	3,083
1899	4,588
1900	4,437
1901	5,222
1902	5,684
1903	5,786
1904	4,252
1905	5,000
1906	6,067

The United States on Jan. 1 1906, possessed 217,072.34 miles of main-line mileage, according to Poor's Manual, and with the 6,067.4 miles put in commission in the past 12 months, the country now has a net-work of 223,139.74 miles of railroads.

Stockholders of the Susquehanna Iron & Steel Co., Philadelphia, will meet Jan. 8 for the consideration of a financial proposition to be submitted by reorganization interests. The plan is being drawn up by a special committee of stockholders of which James G. Lindsay is chairman.

The Pennsylvania Steel Co. has made a preliminary start of its new coke oven plant at Steelton. One battery has been fired up.

Iron Market in the St. Louis District 1906

St. Louis, Jan. 1.—The year opens with far better prospects than did 1906. All indications point to a prosperous era for both producer and consumer. While it may not be that prices will maintain their present high level all through the year, yet enough has been contracted for in advance and enough is known of the demand to guarantee that there will be no decided slump in the next ten months.

While last year opened with a $14.50 market for southern No. 2, this year opens with the price just $9 higher and a demand far more keen even at the higher figure. At this time last year foundries were covering for January, February and March and did not appear to be eager to load up, as the metal was freely offered. Today the first half is practically sold up (with the exception of the margin which the furnaces like to keep open) and melters are buying for the third quarter and last half.

Despite the high prices which have been in vogue for the last three months, not all of the furnaces have been able to reap as big a harvest as the figures would indicate. The market ran along in a $14 groove last winter and spring until April, when signs of weakness were indicated and then price cutting began. It will be remembered that the "friendly agreement" among the three largest southern interests did not check the decline and that the price of iron reached as low as $12.50 for southern No. 2 before the reaction came. At this figure, the melters began to buy, to stock up in earnest. Of course the buying stiffened the price, but thousands of tons were contracted for, running into the next year before the price passed the $15 mark. It is at this figure that many of the furnaces are still delivering iron to consumers.

It is true that they have been tardy on deliveries, but that has been due largely to labor troubles, weather conditions and the car shortage.

Some of the furnaces which were running easy on their contracts refused to enter the market and held out, to take advantage of the fancy spot prices. Their calculations did not miss. The fancy prices came and they have been reaping the reward. All of the furnaces have been able to take advantage of the high prices to a certain degree, but those wise iron makers who refused to book orders on the rise are the ones who are profiting.

Iron men are generally agreed that $23 will not be maintained the whole of next year, but in view of the enormous demand in sight it is apparent that the price will not take any decided slump. A review of the agricultural and commercial conditions shows that the country is enjoying unprecedented prosperity and the people have the money to purchase. Foundries are crowded with orders, fabricated material is wanted in ever increasing demand and car companies cannot begin to keep pace with requirements. There promises no let up in the demand. Consequently, in the face of this demand it is hard to see how there will be any decided falling off in the price of iron. Importations cannot affect this market to any decided extent, since all that iron is required in the east and the tonnage of southern iron used in the east is not large.

DEATH OF ROBERT VIERLING.

Robert Vierling, president of Vierling, McDonald & Co., Chicago, whose death Dec. 20, was briefly noted in last week's issue, was born in Buffalo, N. Y., in 1853. Two years later, the family moved to Chicago, and he resided there up to the time of his death. He received his early education in the Chicago public schools, and started work before 12 years of age to support his widowed mother. His first connection in the iron and steel business was with the old Union Iron Works, Chicago, operated by N. S. Bouton & Co. In 1881, he organized and became president of the firm of Vierling, McDowell & Co., founders and structural fabricators, and in the twenty-five years intervening, has been continuously identified with it. He also assisted in forming the firm of Paxton & Vierling Iron Works, Omaha, Neb., of which his brother, A. J. Vierling, is resident manager.

Mr. Vierling was a member of the Union League and Kenwood clubs; president of the Architectural Iron League of Chicago, and a member of the Contractors' Council, of the same city. The following were the active and honorary pall-bearers at his funeral, all of them old friends and long-time business associates:

ROBERT VIERLING.

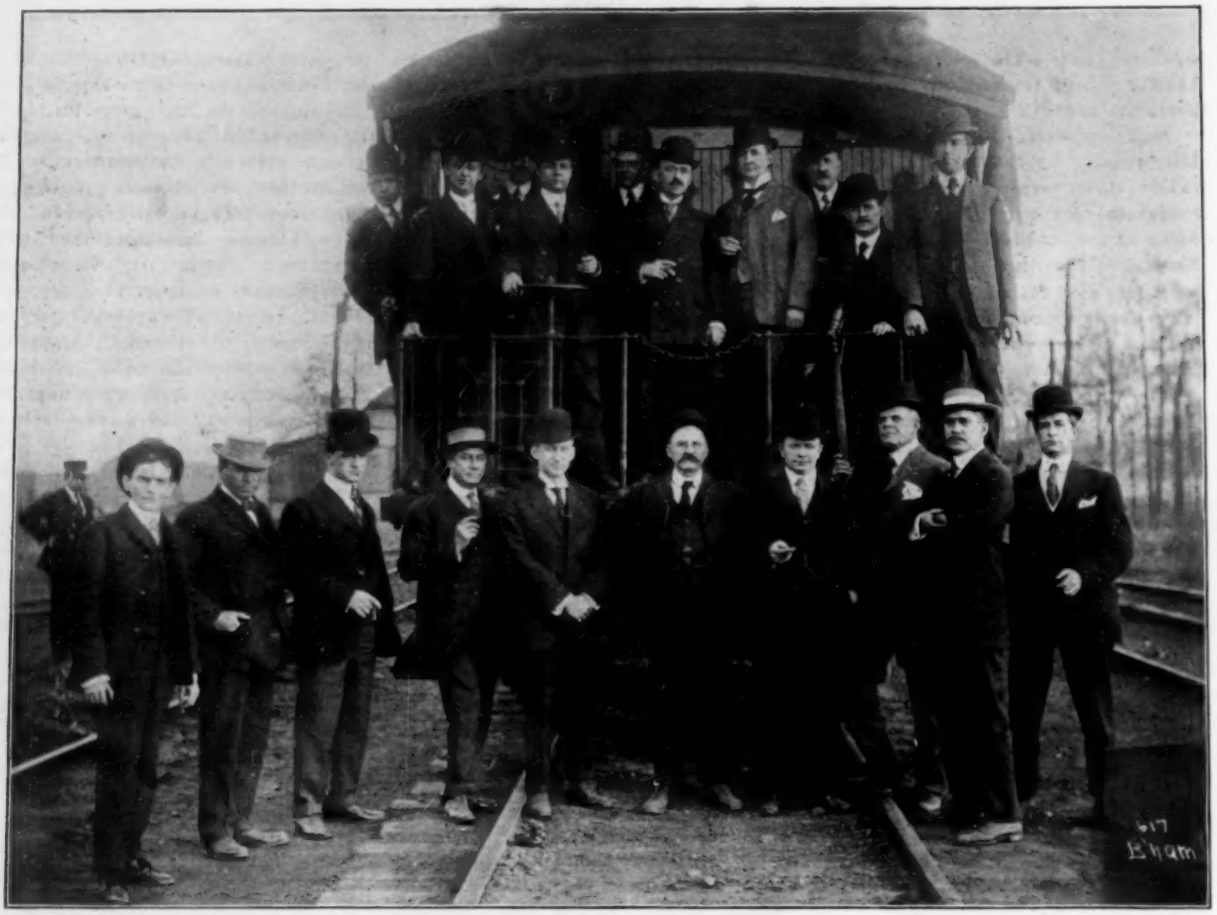
Active.—C. B. Whipple, E. T. Cushing, Robert Bennett, B. C. Sammons, G. M. Benedict, A. E. Coleman, W. C. Nelson, W. H. Hafner.

Honorary—Erastus Foote, W. H. Pratt, L. A. Carton, E. G. Elcock, J. C. Fleming, A. C. Buttolph, Alfred Grossmith, P. William O'Brien, A. M. Graves, W. B. Gervais, I. D. Richards, Edwin Maher, D. N. Barker, W. A. Paxton, William D. O'Brien, Howard Henderson, J. J. Hattstaedt, Adrian Vanderkloot, Dr. W. S. Hector, Arnold Hinkens.

An intimate friend of Mr. Vierling said of him:

"In the death of Robert Vierling, there passed away one of the most lovable of men, most loyal of friends, and most considerate of employers. No man strove to adhere more strictly to the Golden Rule than did he, whether in dealing with labor delegations, in the councils of employers' associations or in the conduct of his business. Possessing in a marked degree the courage of his convictions, Mr. Vierling was always loyal to a principle and steadfast to a promise. He championed the cause of labor when confident its demands were just, but he was no less fearless in denunciation when impressed that its position was wrong. In the struggle for the "open shop" in Chicago, he was ever to the front rank, but never demanded more than he was willing to give; and to the generous support of time and energy he gave the cause may be attributed, in large measure, the breakdown in his health."

TENNESSEE—REPUBLIC SELLING FORCE ON SOUTHERN TOUR.



Standing on rear of train (reading from left to right:)

C. M. Hoppe, sales manager, St. Paul; C. T. Johnston, sales manager, Cleveland; W. W. Arpe, St. Louis; C. H. Eib, Chicago; M. E. McKee, sales manager, Cincinnati; Mr. Collard, Birmingham; Severn P. Ker, general sales manager, Pittsburg; F. A. Burr, general sales manager, Birmingham; W. H. Knight, Cincinnati; E. B. Blandy, sales manager, New York; Ralph P. Zint, assistant to general manager of sales, Pittsburg.

Standing on ground:

W. H. Johnson, assistant traffic manager, Birmingham; Mr. McCarthy, superintendent of mines, Birmingham; Mr. Frawley, Birmingham; L. C. Frazer, Birmingham; George D. Evans, Cleveland; Mr. Brannon, Birmingham; Willard Wilson, assistant general manager of sales, Birmingham; J. E. Hubbert, manager of sales, Chicago; D. W. Guthrie, St. Louis; G. L. Claypool, manager of sales, Pittsburg.

PERSONALS.

John W. Gates has made the prediction that in 20 years Birmingham, Ala., will have a population of 1,000,000.

Henry C. Frick has been named to succeed the late Amos R. Little, as a director of the Pennsylvania railroad, in which he is a heavy stockholder.

Floyd Rose, formerly assistant superintendent of the Carbon Steel Co., Pittsburg, has been made general superintendent of the Portsmouth Steel Co., Portsmouth, O., assuming this position Jan. 1.

John Alexander, for many years representative on the Pacific coast of the Rhode Island Perkins Horseshoe Co., Providence, R. I., has been chosen superintendent and general manager of that company.

W. E. Bassett has been appointed superintendent of the Aurora Tool Works. Co., Aurora, Ill., to succeed Albert Weigel, resigned. Mr. Bassett was formerly connected with J. H. Day & Co., Cincinnati.

William B. Schiller, president of the National Tube Co., who has been confined to his home since a runaway accident in September, recently had another operation performed on his foot, and a speedy recovery is now expected.

J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., is expected to return from Europe within a few days. On his return a successor to M. M. Richey, who resigned the vice presidency to return to railroad work, will probably be named.

Joseph H. Hoadley, New York, has been elected president of the Alabama Consolidated Coal & Iron Co. He will succeed Col. T. G. Bush, former president and organizer, who retires from the company, but remains at the head of the Shelby Iron Co. and other interests. His son, Morris Bush, has been made resident manager of properties at Birmingham. William C. Seddon, of Baltimore, becomes a member of the executive committee.

Chattanooga Furnace of the Southern Steel Co.

By an Editorial Representative of The Iron Trade Review.

The Southern Steel Co. has recently rebuilt and put in operation the Chattanooga furnace located at Chattanooga, Tenn., which now is one of the most modern and best arranged blast furnace plants in the south. The accompanying illustrations show some of the details of this plant. It is located in the city limits of Chattanooga and within one thousand feet of the Tennessee river.

The furnace is 16 ft. diameter at the bosh and 75 ft. high. Its capacity is 200 tons of pig iron per 24 hours. The stock house is erected on a concrete foundation, which extends into the earth a distance of 20 ft. A skip hoist with car of 80 cu. ft. capacity is used for elevating the material to the top of the furnace which is equipped with a "Brown hoist" top and distributor, these being shown in the illustration, Fig. 2. (This photograph was taken in the shop before shipment.) The main features of this type of hoist and distributor are the bridge, top framework, bell-beams and bell-trolleys, bell and hopper, distributing device and rotating mechanism.

The bridge consists of an inclined steel truss of the parabolic type, which reaches from a pit in the stock house to the top of the furnace. This bridge carries T-rails on which the skip car travels. The top frame work is of steel construction and is located at the top of the furnace platform, which supports the rails carrying the skip-car. These are continuations of the rails on the bridge and are curved in such a manner as to carry the car in over the hopper. Just outside these rails, starting at a point near the level of the platform, a second set of rails is arranged to take an outside pair of wheels in such a manner that the front end of the car runs in on the curved rails, while the rear wheels are carried on a line parallel, or nearly so, to the rails on the bridge, thereby raising the car and dumping the load into the bell.

The distributing hopper is of cast iron with a curved spout at the lower end which directs the material to one side of the bell. The lower end of the spout is provided with a door which closes the opening at the lower end whenever the bell is lowered, thus preventing the escape of gas. The spout and hopper are revolved by suitable mechanism of the top of the furnace, in order to distribute the charge evenly. The beams seen in the photograph, Fig. 2 projecting to one side beyond the latter are used to remove the distributor and top from the furnace and hold it at one side while repairs are being made.

The furnace is installed at one end of a cast house 60 x 200 ft., which presents a number of interesting features. The main supports are cast iron columns on brick foundations. The roof, which is provided with a monitor, is

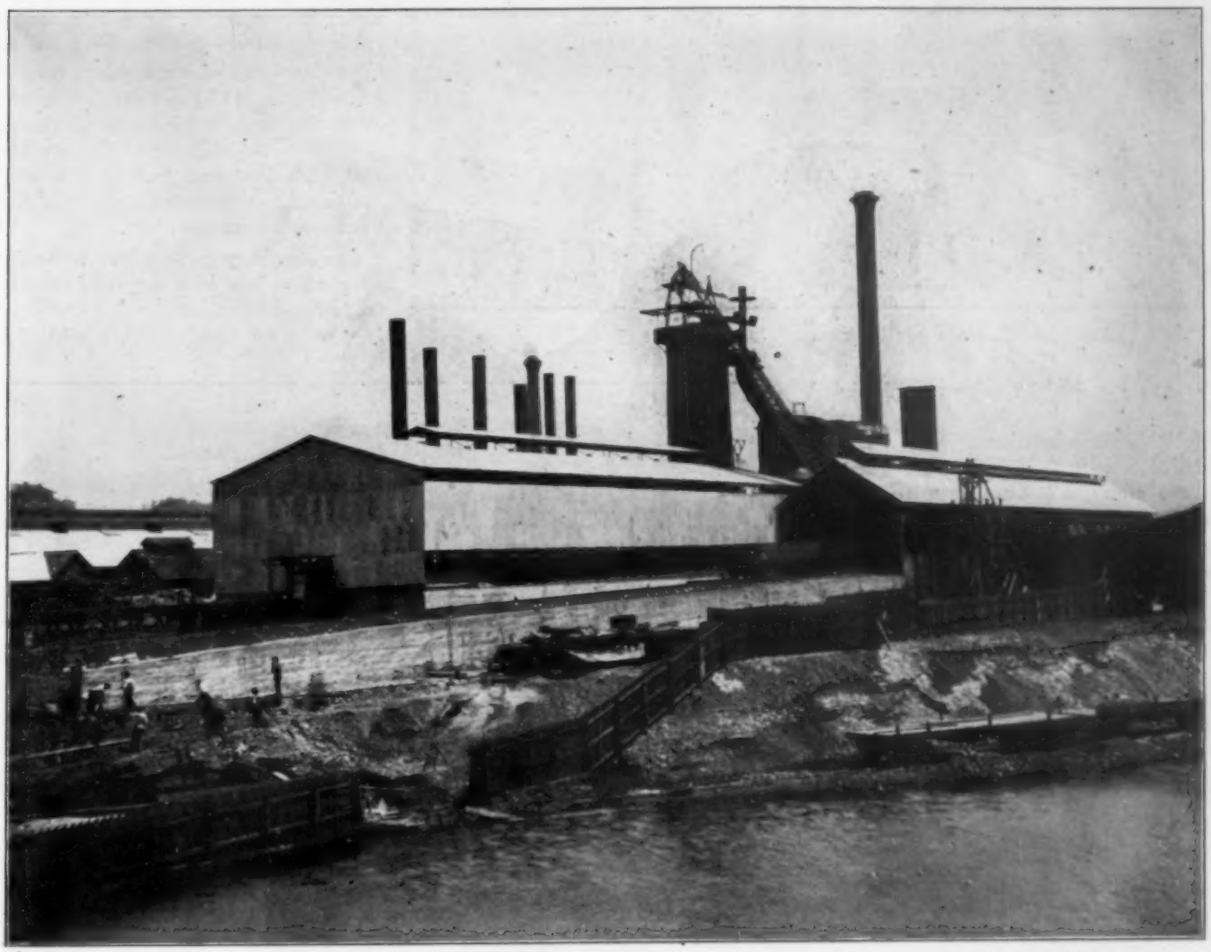


FIG. 1.—GENERAL VIEW OF CHATTANOOGA BLAST FURNACE.

supported on steel trusses. Roof and sides are of corrugated iron. A narrow gauge railroad track runs through the center of this house its entire length, being a continuation of a trestle which extends through the center of the iron yard located at one end of the cast house. The runners for conveying the molten iron to the molds run along either side of this track. When the pigs are cooled they are loaded on narrow gauge cars on this track, which are then moved on to the trestle. The trestle is at an elevation of about eight ft. above the iron yard, and at intervals of about 10 ft. on either side of the trestle are posts surmounted with iron breaking blocks. The pig iron is thrown from the cars on to these breaking blocks and the broken pigs are then graded and piled in the iron yard while awaiting shipment. The cars are operated along the track on the trestle and through the cast house by means of a cable, driven by a hoisting engine which is located at the extreme end of the trestle.

The slag is disposed of simply and efficiently. When it is tapped from the furnace, it flows through a gutter in the cinder yard, which is composed of a series of runners leading to a bed and runs alongside the cast house. The slag is diverted into a number of runners on this bed and is then sprayed with water from a number of lines of hose and cooled. A spur track is laid in a pit between the slag bed and the cast house and the cooled slag is shoveled into gondola cars on this track. The slag is in great demand by the railroads in that section of the country for use as ballast, and no trouble is found in disposing of all the slag from the furnace.

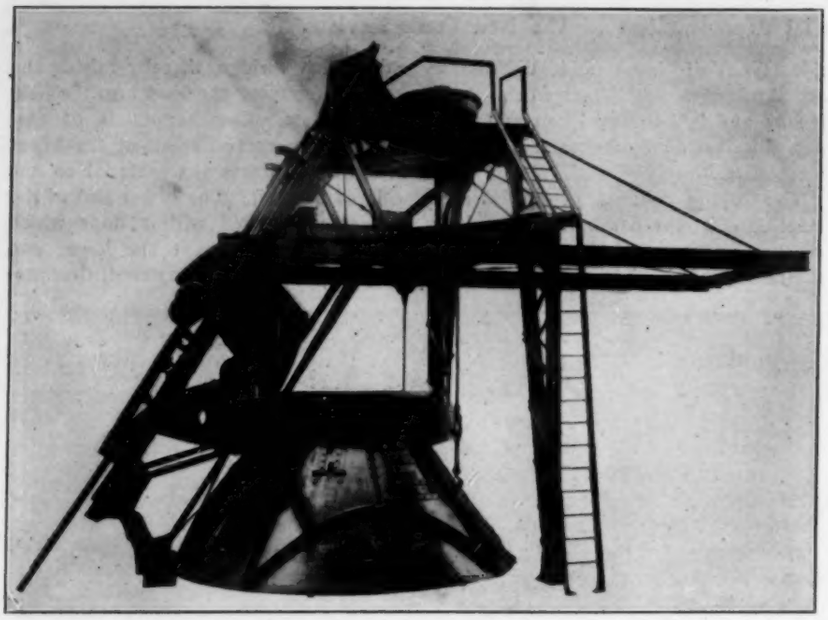


FIG. 2.—"BROWNHOIST" TOP FOR CHATTANOOGA BLAST FURNACE.

The stock house is a building 34 x 400 ft., located on the opposite side of the slag bed from the cast house and the skip hoist for the furnace enters it at about the middle point. It is built in two levels with a pit under the lowest level for the reception of the skip car. A double track is laid through the upper level of the stock house, on which supplies are brought in, and which are dumped into bins directly under the tracks. A motor driven stock car runs along the track on the lower level of the stock house, receives its supplies of ore, coke, limestone from the various bins and discharges them into the skip car. The ore bins are located at one end of the stock house, the limestone and coke bins being at the opposite end.

The auxiliary equipment of the furnace comprises four stoves, each 18 x 60 feet, one dust catcher, and one equalizer 20 x 20 feet, together with four

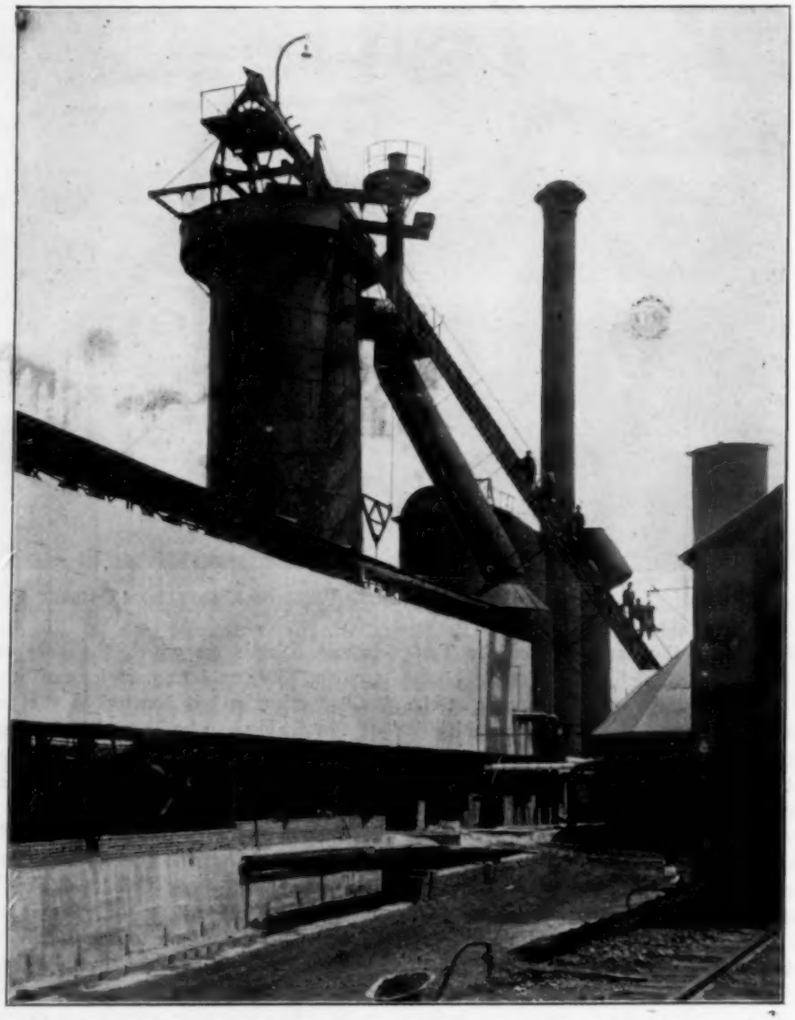


FIG. 3.—SLAG YARD, SKIP HOIST AND STOVES, CHATTANOOGA BLAST FURNACE.

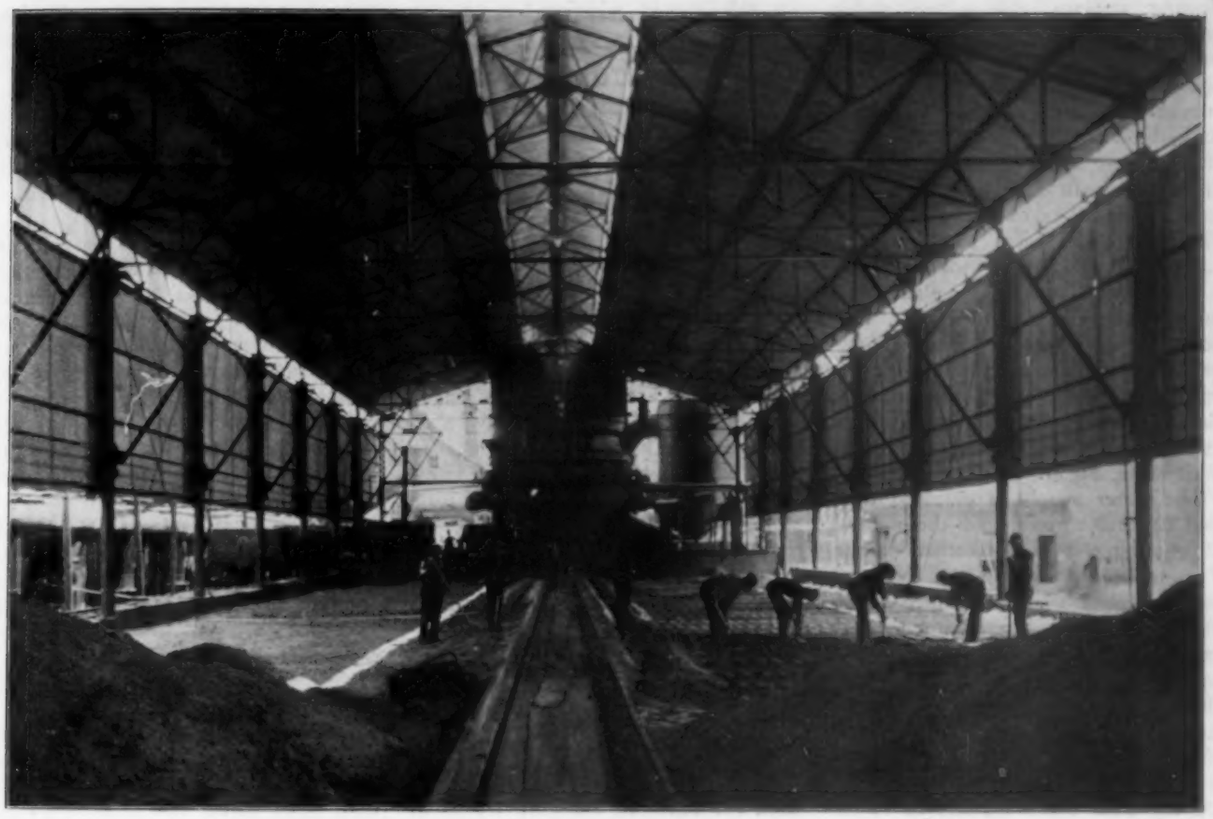


FIG. 4.—INTERIOR OF CAST HOUSE CHATTANOOGA BLAST FURNACE.

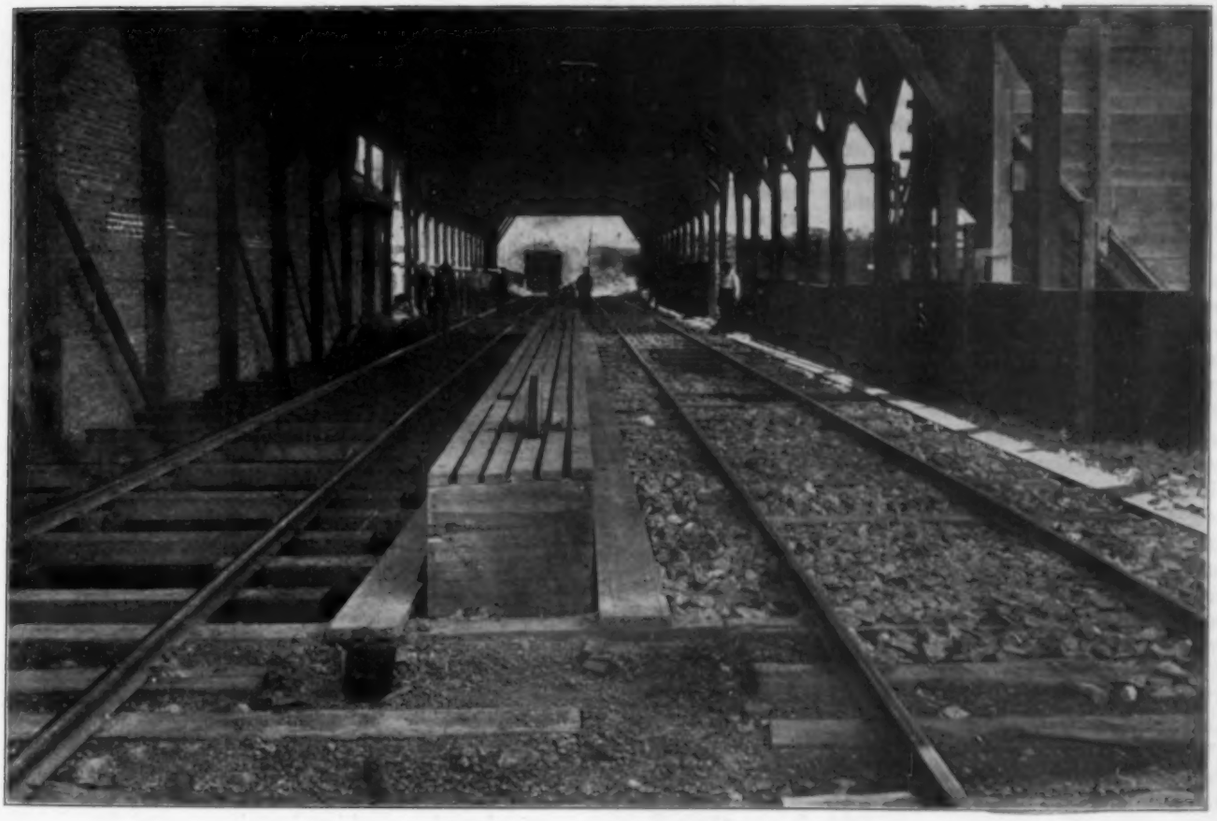


FIG. 5.—INTERIOR OF STOCK HOUSE, CHATTANOOGA BLAST FURNACE.

blowing engines, one 44-inch steam cylinder x 90-inch air cylinder x 48-inch stroke, one 42-inch steam cylinder x 84-inch air cylinder x 54-inch stroke, one 42-inch steam cylinder x 84-inch air cylinder x 48-inch stroke and one of the latest improved Mesta engines, 44-inch steam x 84-inch air x 60-inch stroke. A stack seven feet diameter by 160 feet high serves to convey the burned gases from the stoves. Steam is supplied to the plant by seven batteries of water tube boilers, aggregating 2,100 horsepower. These are installed on the opposite side of the cast house from the slag bed. Their location can be seen by the position of the stacks in the illustration, Fig. 1.

The water supply is obtained from the Tennessee river, and the method of obtaining it is somewhat unique. Two tanks are sunk in the river one being emptied while the other is filling. The water is discharged from each tank, alternately, by means of compressed air furnished by a pair of air compressors in the power plant. An automatic valve directs compressed air into each tank as soon as it fills with water, thus discharging it into a filtering plant which consists of 14 circular tanks 48 inches in diameter by 12 feet in height with a baffle wall in the center of each tank. Openings are cut in these baffle walls and screens are placed over each opening. The tanks are arranged in a straight line, a wooden trough extending across their tops. The water from the river is discharged into this trough and flows into the first two or three tanks through screens placed over their tops, then passes from the tank to the other all coarse impurities being strained out. It is finally discharged into a large reservoir 20 feet in diameter x 22 feet deep located at the bottom of a standpipe 12 x 60 feet, whence it is drawn off by a battery of pumps for use in the furnace and around the plant. There are five pumps of varying sizes located alongside of the reservoirs, which discharge into a standpipe 12 feet in diameter by 60 feet in height, which acts as a storage and pressure reservoir for the entire plant. In another portion of the same building is the auxiliary machinery including two air compressors and two generators for electric lighting, and operating motor larry car in stock house. The furnace has ample shipping facilities, two spur tracks of the Nashville, Chattanooga & St. Louis R. R. run to the plant. It is also connected with the Chattanooga Belt railway which intersects all the railroads entering the city.

BRITISH SHIPMENTS

OF PIG IRON TO AMERICA ARE LIGHTER THAN FORMERLY,

But Contracting for Later Delivery is General.—Advances Continue in All Lines.—Italy Enters the Market.

Office of THE IRON TRADE REVIEW.
Prince's Chambers, Corporation Street,
Birmingham, Eng., Dec, 20.

Shipments of pig iron to America are not quite as heavy as they were, but contracts are now being arranged covering deliveries as far forward as the spring. The trade continues to yield new developments. The latest is the shipment of pig iron direct from Middlesborough to New Orleans. A couple of vessels have been chartered to load Cleveland pigs, and the entire order is said to amount to 20,000 tons. This is understood to be the first order of the kind. Italy has lately appeared on the scene as a buyer, and during the past month has taken from the tees 13,700 tons. Local producers fear that the heavy foreign demand may inflate prices unduly and may have the effect of checking legitimate home business.

Excitement in Advances.

The last fortnight has been an eventful period in the iron trade. The last two exchange meetings have developed more excitement than for years past and have brought also a most important series of advances. Of these, the principal one was the rise of 10s in marked bars, bringing the standard to £9 per ton. The customary circulars were issued by all of the marked bar houses in South Staffordshire.

For some reason, the advance was kept quiet on market day, a rumor reaching interested people just at closing time, but within two hours of this the circulars were in the hands of the customers. Apparently, the object of this reticence was to avoid giving a further fillip to pig iron, which is already scarce and dear. A somewhat similar policy was adopted by the strip makers, who had a supper the same evening, and put up prices 7s 6d per ton.

Higher Prices General.

Several other advances have taken place. The iron founders met last Thursday, and increased the price of chilled rolls £1 per ton, and grooved, grain rolls, and other castings, 10s per ton. They have been squeezed somewhat by the high price of pig iron, and have only kept going and cleared a profit by keeping up a maximum turnover. For some reason, the cold blast pig people have made no formal declaration of advance, but prices are put up all the same and foundry iron recently quoted £5 12s 6d is now £5 17s 6d. Iron founders are a little sore over this, because it prevents them justifying their advance to their customers.

The Unmarked Bar Association, holding a meeting under the presidency of E. Parks M. P., declared an advance of 5s, this being the second in two weeks, making the price £7 10s. Galvanized sheets are in the midst of a boom, selling at the remarkable figure of £14, though the standard minimum is only £13 5s. Some surprise is expressed at the moderation of the marked bar advance, but it is understood that, assuming improvement continues, there will be another rise at Quarter Day. Slit rods have been advanced from £8 to £8 10s, while the trade in high class wire continues excellent, one maker having just booked about a thousand tons at the standard figure of £10 10s per ton. For steel bars and billets, prices are strong, and some houses have closed their books to all comers until April next; the prices then are to be £6 12s 6d, which is from 7s 6d to 10s above the present figure.

Scarcity of Hematite.

There is not much pig iron actually selling here at present; but this is because most people have supplied their wants for some little time to come. But there are great complaints about short and slow deliveries. German orders for pig iron will probably be diverted to Cleveland or Glasgow, all stocks from Northampton and Derbyshire having been cleared out. One large smelting firm last week declined an order for 10,000 tons of Derbyshire pig iron, and a second one for immediate delivery of 500 tons. There are serious fears in the north of England of a famine in hematite, the only available stock for the supply of emergencies being about 77,000 tons. The price of Cleveland pig iron has given way a little, No. 3 quality having fallen from £3 3s 6d to £3 2s 6d in a couple of days. The drop for the week is half a crown.

The progress of pig iron prices is shown by an official list just published. Iron which in June, 1905, sold at £2 2s 6d is now £3 2s 6d. Italy has lately appeared on the scene as a buyer, and during the past month has taken from the tees 13,700 tons.

One of our threatening labor difficulties has disappeared for the time being. The galvanized hollowware

makers of the Black country have withdrawn their demand for higher wages. This was the result of a letter from representative employers pointing out that certain firms would refuse all advances because their men were not connected with the union. The applicants, apparently, were unable to bring their fellow-workmen into line, and the wage movement accordingly collapsed with some suddenness.

Iron Exchange Remodeled.

Many American iron masters will be familiar with the Birmingham Iron Exchange. While the general meeting hall is fairly satisfactory, the surrounding offices have been dismal and inadequate. The whole place has been now overhauled, and the offices reconstructed. The entrances are of polished granite, the walls are tiled up to the ceiling, and the floors laid in large squares of black and white marble. Fire-proof arrangements and provision for escape in case of fire have put the finishing touch to one of the finest sets of buildings in the city. In opening the new building, on Thursday, J. C. Vaudrey recalled the fact that when the main block of buildings was opened in January, 1865, in the presence of the then mayor, Sir Henry Wiggin, John Bright M. P., and other well-known men, the floors were sprinkled with eau de cologne, which filled the hall with a delicious scent. Mr. Vaudrey remarked that such a proceeding would cause some surprise in the present day.

Jubilee of Steel Making.

The jubilee of the Bessemer and Siemens processes of steel making were celebrated at Glasgow on Saturday at a meeting of the West of Scotland Iron and Steel Institute. Bennett H. Brough, the secretary of the London Institute, said that America was only now beginning to introduce gas engines, using the waste gases from the blast furnaces, whereas these engines had been in operation in Scotland for eleven years. T. B. Rogerson, president of the West of Scotland Institute, said that in America practically all the steel bars were made by the Bessemer process, and in Germany 70 per cent of the steel was manufactured in the same way.

The firm of Messrs. Robert Stevenson & Co., has just turned out two gigantic engines from the Darlington works, and three others are to follow for shipment to the Argentine. They are extremely heavy in build, weighing 124 tons, whilst the tenders hold 5,500 gallons of water, and have 630 cubic feet of space for the storage of wood. The boilers weigh 47 tons, and the engine frames are nearly 36 feet long, weighing 36 tons. The engines are intended for hauling heavily-laden trains over mountain gradients on the Argentine Great Western Railway. The extreme width of the tenders—about 11 feet, render the traffic on the opposite line of railroad between Darlington and Liverpool impossible, and all other traffic was therefore suspended while the engines were in transit. Other similar orders are expected.

Ship building orders have not lately been quite so plentiful as they were, and some yards have been rather short of work, but the capacity of the British yards is now so enormous that immense orders are wanted to keep them going. Messrs. Harland and Wolff, the famous Belfast builders of Atlantic liners, have just received an order from the White Star Line to build another steamer for its Atlantic trade. She is to be 630 feet in length and her twin screws will be driven by reciprocating engines.

Firms Report Better Profits.

The Millom & Askam Hematite Iron Co. has increased its profits during the past year from £43,086 to £61,559, and have been enabled to increase their allowance for depreciation from £20,000 to £30,000. The ordinary shareholders are still getting no dividend, and the preference dividend is one year in arrear. At the annual meeting held at Preston, Mure Ritchie took a cheerful view of the situation, but considered that in view of the certainty of future dumping some measures of fiscal reform should be granted. He remarked that there was a big demand from America and Germany and these countries were not now dumping cheap iron into this country. When trade became quiet, however, they would do it again, and he advocated fiscal changes to obtain fair play for British makers. Mr. Burns suggested that the company should manufacture speigeleisen and ferro-manganese, and the chairman promised this should have consideration. Henry Mungall was elected trustee in place of the late Sir David Dale, Mr. Heath, and Mr. Wade were re-elected directors.

Another company issuing better reports, is the Blanevon Iron & Steel Co., which has increased its profits from £23,633 to £28,405, and its dividend from 5 per cent to 10 per cent. The company has, in addition spent £51,000 on additions and alterations to collieries, plants and furnaces. The North Lonsdale Iron & Steel Co., is able to increase its dividend from 4 per cent to 7 per cent, while adding £5,000 towards the renewal funds. There is a little note of dissatisfaction in the directors' report. They express the fear that the heavy foreign demand for pig iron by unduly inflating prices may possibly check legitimate home business on which the company mainly depends.

Electricity in Tube Mills.—The extent of the invasion of steel works and rolling mills by electric power is again emphasized by an order recently placed by the Seamless Tube Co. of America, for four 300-horsepower Allis-Chalmers compound-wound, non-reversible direct-current motors. One of these will be connected by gears to a 20-inch two-high mill for rolling tubes, one will be direct-connected to a mill for piercing steel billets and two will be connected by gearing to cold draw benches for cold drawing tubes. Speed variation will be obtained by means of shunt field regulation and each motor will be furnished with a starting panel including an automatic circuit breaker and switch.

Safety Device Exhibit.—Space is now being assigned for exhibits of the First International Exposition of Safety Devices to be held at the American Museum of Natural History, New York, beginning Jan. 29 and continuing two weeks. W. H. Tolman, 287 Fourth avenue, New York, is director of the American Institute of Social Service, under the auspices of which the exposition will be held. The exhibits will include safety devices for wood and metal-working machinery; stamping, grinding and polishing machines; safeguards for boilers, elevators windlasses, cranes and hoisting machinery; textiles and building trades; safety lamps and explosives; quarrying and agriculture; chemical industries, safety from fire; railway and trolley safety.

The General Electric Co. reports operations for the nine months ended Oct. 31 as follows: Sales, $41,774,812; manufacturing cost, $34,303,325; net operating profits, $7,471,487, an increase of 43 per cent over the corresponding period of the previous year.

The Imperial Steel Works, which the Japanese government is to operate on the Island of Moji, is planned to entail a cost of about $10,000,000. Contracts for large amounts of steel-making equipment are now being placed in the United States.

LARGE INCREASE OF CONSUMING CAPACITY

HAS BEEN A PROMINENT FEATURE OF THE YEAR IN THE EAST.

General Rise of Price Levels.—Unusual Conditions in Pig Iron Market.—Causes of Abnormally High Prices.—Slow Deliveries and Labor Troubles.—Importations Relatively Small.—Unprecedented Demand for Structural Steel During First Eight Months.

By A. W. Van Zwaluwenburg.

The activity of the iron and steel industry as reflected in the markets of the eastern part of the country during the past year has made more evident the tendency of the east to become a consumer and not a producer of pig iron and semi-finished products. The consuming capacity of the district has increased enormously during the year. Foundries, machine shops and manufacturing plants of all kinds have been enlarged or built anew, but the output of pig iron and crude steel remains practically stationary. The present reign of extremely high prices is primarily due to the fact that the middle west and south could not supply material to the eastern manufacturing districts as rapidly as required.

Extreme Activity in Pig Iron.

The year began with the wave of prosperity in the manufacturing industries rising. The tide of extreme activity has swept along with only a slight period of hesitancy in the early summer, and has carried prices to abnormal heights. At present the readiness to buy pig iron for far future delivery at very high prices is remarkable, a condition which is fairly unique in the history of the trade.

During the first months of the year, business in all grades of pig iron was good. The demand was active and increasing steadily in volume. In the spring and early summer there was a period of doubt. Crops promised well, but the business of the country waited to see if the promise would be fulfilled. In July all doubts were removed and it became evident that the season of great activity along industrial lines would continue for another year. The blast furnace capacity of the country had not been materially increased and certain of the pig iron producers began to make preparations for the rush which they knew would come.

In New England foundry iron producers of New York state had been selling heavily throughout the summer at prices which practically shut southern furnaces out of the market. In the early fall it became apparent that transportation facilities would not be equal to the demand occasioned by the great volume of crops to be moved and the unusual activity in all industries, and freight difficulties began to appear. When the New England foundrymen received only 10 to 15 per cent of shipments promised by the New York state furnaces, there was an inevitable rush to cover. Prices for spot iron rose enormously and the end is not yet.

Sound Economic Policy.

The shortage of supplies was due largely to inadequate transportation facilities, but in the rise of prices there has been another important factor. For a long time a powerful influence had been at work tending to keep prices at a level insuring reasonable profits. A great many of the most important interests had adopted the sound economic policy of avoiding panics by promoting steadiness. The effort to this end was in no sense organized, but it was nevertheless effective. When, in the early fall a group of producers disposed of a quarter million tons of basic pig at $17.50, it was generally looked upon as a good stroke of business. Almost immediately afterward, the ability to secure very much better prices led to the utter rout of the abstract policy of steadiness. Freight and labor difficulties increased as the winter came on and all policies save that of, "Get as much as you can," disappeared. During this period of excitement, one lot of No. 2, foundry iron brought $28.20, a price higher than that of standard sections of finished steel rails.

During the last weeks of the year conditions have not improved materially. The car famine is such that furnaces in the south have been forced to pile thousands of tons of pig iron in individual yards, and some of the northern producers are running at no more than 40 per cent of the total capacity. Coke producers are unable to secure cars for days in succession and labor difficulties are serious in many sections.

When the pinch for foundry iron came, cargoes of Scotch and Middlesboro pig were promptly started across the Atlantic to relieve the pressure. These importations, although relatively small in amount, have undoubtedly kept some foundries running which, lacking timely supplies, would have been obliged to shut down, and they have also prevented the soaring of prices above all bounds of reason.

The Structural Steel Market.

Rolled shapes and fabricated material began the year leading all other lines of production in activity. At the close structural steel is very nearly at the bottom of the list. In the early months of the year inquiries for steel and new building projects were so plentiful that many wondered where the supplies would come from. For months it was necessary to book far ahead in order to secure delivery and premiums for prompt shipment were common. This period of great promise continuued for about eight months. Since then business has been almost dull, if it is permitted to use the word in these flourishing days. The mills have not felt the loss of the unusually keen demand of the early months. They have been busy catching up on old contracts and furnishing shapes for the car builders and kindred industries.

The reasons for the falling off in the demand for structural materials are somewhat obscure. In many cases building operations have been halted or at least postponed by the extreme prosperity of business. The high price of labor and of material other than steel and above all the stringency in the money market have undoubtedly tended to discourage the launching of extensive building enterprises. The increase of mill capacity is also a factor of importance. At present competition for contracts is keen while in the early months of the year purchasers sought the mill able to furnish the material and were frequently willing to give a bonus for reasonably prompt delivery.

Quoted prices have remained fairly constant throughout the year, but during the last months the increased cost of raw material has pointed to an advance. One producer has announced an increase of price for practically all its products, and the general feeling is that others must follow. There have been none of the abnormally high prices which marked the boom of 1902.

During that period, purchasers were willing to pay almost any price, but during 1906, there was more disposition to wait or get along without.

Taken as a whole, the year has been a very prosperous one in the structural steel market. Nearly all of the mills have booked more than their capacity to roll. Car builders have given and are still giving the mills a steady stream of orders for the lighter shapes, and this demand is more likely to increase than to diminish during the coming year.

Unprecedented Demand for Rails.

All the mills have been running at full capacity throughout the year and are sold up far into the future. The prospects are that a still greater tonnage will be rolled during 1907. Many of the existing mills are constantly breaking records for output, the Tennessee Coal & Iron Co. will probably be ready to use its new equipment, and toward the end of the year the Bethlehem Steel Corporation mills may add to the total.

The demand for standard rails has been unprecedented, as all the world knows. There has been some talk in the newspapers of late in effect that the railroads have been hampered during this year by failure to secure delivery of rails. This is unjust to the rolling mills and may be denied emphatically. There may have been an occasional delay in outlying districts, but as a rule the rails have been delivered as rapidly as they could be laid. In fact, there have been a number of cases in which shipment was postponed at the request of the roads because of inability to secure labor to perform the track work.

Plate Mills Busy.

Great activity in the structural field and among the builders of rolling stock for the railroads has insured a full year for the mills. Many records have been broken and prices have risen, especially during the last months. Locally the construction of many large buildings has created a brisk demand for tank and boiler work, and the shipbuilders have taken a fair tonnage. New demands for plate have come from the steel car builders and the use of rolled plate in the construction of large pipe has also increased greatly during the year. These new demands are likely to remain and to increase and will be a constant source of business in the plate market.

The Columbus & Hocking Coal & Iron Co., reports that its earnings for November were considerably in advance of $27,000, the record month of the company.

SYSTEM

Its Imperative Importance to a Successful Business Man.

By F. W. Low, Rockford, Ill.

In keeping with the advancement made in other lines during the past few years, there has been a corresponding development in the devising and introducing of cost and office systems. This advance has been the outgrowth of an increased demand on the part of the progressive business manager for a more complete knowledge of the conditions surrounding his particular line of business.

Ten or twelve years ago, well defined cost systems were confined to a few of the large interests, while today the large, medium sized and many small concerns are adopting them, not simply as a temporary thing, but as a permanent part of their organization.

Competition becoming more keen in all lines of business each year, it is necessary for the business man who would wish to be or who would wish to continue to be successful, to place himself in a position where he knows all the facts possible concerning his business, obtainable with a reasonable financial expenditure.

An argument is frequently made by business men that they could not change a selling price because of their knowledge of costs. This may be very true in some cases, but even in these cases, if an article is showing a loss the cost system gives warning to reduce its cost, or if unable to do this, to throw the article out of the line of manufacture. This is true, of course, if the article is not being made to help the sale of some other commodity on which there is a substantial profit.

Oftentimes business houses go on year after year contented with the profits they are making, as these profits represent a fair rate of interest on the capital invested in the business, while if the dead wood could only be thrown out and profitable work put in to take up its time and space, a surprising increase of profit would be the result. This feature the writer in his experience installing system has had the pleasure of observing in a number of cases, with the profits increased to an extent that seemed almost incredible. A concern may show a net profit of say $150,000 a year, composed of a profit of $225,000 on certain lines, and a loss of $75,000 on other lines. With such a conditon existing and with a cost system installed to locate the condition, one can readily see what a large possible chance there is for improvement.

Going still further into the matter, the organization developed through a properly devised system indicates the weak points all along the line, not only as to whether a particular article is profitable, but as to where the excessive cost exists in the process of its manufacture. By being able to analyze a cost satisfactorily, short cuts can often be devised which will materially reduce it, thereby changing the commodity from a mediocre or losing proposition to a paying one.

A prominent manufacturer told the writer some time since that he candidly believed that the cause for most of the failures in his line was the lack of knowledge as to the cost of production. Because one man sells an article at a certain price, it does not follow that a competitor can profitably name the same selling price. The efficiency of a plant enters more into the cost of production than many people realize, and when a manufacturer bases his selling price on that of a competitor, he is taking the chance of having a plant of the same efficiency, of their labor and material costs being the same and of his competitor basing his selling on a correct cost price.

It too often happens that a concern gives too little attention to the general office end of system work, possibly feeling that it does not pertain to costs. This is a serious mistake, as much of the accuracy of the work all along the line is dependent upon the foundation established in the general office, and many cost systems are weak because of this laxness. Then again, there are new methods being brought out from time to time, which in many cases give a much better result with considerably less work.

However, in face of all the advancement made in system work during the last few years, the business world is still confronted with a condition, varying all the way from the man who knows his costs and profits monthly, and in some cases more frequently, to the man who does not know his lump profits yearly, much less the cost of any of the articles he produces.

Willis King on the Outlook.—Willis L. King, vice president and general manager of the Jones & Laughlin Steel Co., is quoted as saying: "Great as has been the prosperity of the steel industry this year, it will be even greater next year. This is due to the general prosperity and great growth of the country. The greatest prosperity has not yet been reached."

THE RELATION OF EDUCATION TO NATIONAL WEALTH.[1]

By Dr. William Kent.[2]

The most important event in the economic history of our time is the great increase of wealth which has taken place in all the civilized world within the past hundred years and especially within the last thirty years. The chief cause of this increase was the improvement of the steam engine by James Watt and his successors, and the chief cause in more recent times has been the growth of technical education among the people. Tredgold's famous definition of engineering is "the art of directing the great forces of nature for the uses and convenience of man." The greatest force of nature which can be utilized in the production of wealth is the force produced by burning coal and the art of directing this great force of nature is the art acquired by technical education.

Thirty-five years ago a small group of men conceived the idea that the best way to give a man a technical education was not to send him to a shop but to a new kind of technical college. Such colleges were founded first by private endowment and later by state grants. At first they turned out only a few graduates each year and for them there was no demand, for the world had not then learned that it needed technically educated men, but these men found their jobs and in a few years they had so proved the wisdom of the founders of the schools that the numbers of the schools increased rapidly so that their graduates now amount to some thousands each year and the demand for them is increasing as fast as the supply. There is no need to enlarge further on the technical colleges. Their benefits are found in every railroad and industrial establishment throughout the civilized world.

Fifteen years ago, one man, Thomas J. Foster, conceived another idea, that there was another method of giving a man a technical education, the method of the correspondence school. This school was not intended to be, and is not in any sense a rival of the technical college. It was not for that very small fraction of the population who first had the opportunity and ability to graduate from a high school or academy and afterwards to spend four years more in getting the higher education; it was for that vastly larger fraction, the men of mature age who were at work and who desired to get a technical education while still at work. Some of the amazing results of the correspondence schools we have seen and heard today. In fifteen years they have had more students and turned out more graduates than all the technical colleges put together have in thirty years, and now they have an enrollment about equal to that of all the universities, colleges and higher grade technical schools in the country.

I have spoken of two kinds of technical schools, the technical college and the correspondence school. There is a third kind of which mention should be made: I refer to the trade school. The United States is far behind Germany, France and Switzerland in the development of this kind of school but the beginning has been made, and the Williamson Trade School at Philadelphia, is a fine example of what such a school should be. Mr. James M. Dodge in his presidential address before the American Society of Mechanical Engineers gives statistics showing that the young men who had obtained a three years' training in the Williamson Trade School had a far greater earning power in the shop when they reached the age of 22 years than had men of the same age who were trained in the shop and did not have the advantages of the school. This is a most important educational and economic fact. If we can increase the earning power of a man by sending him to a trade school between the years of 16 and 19 instead of sending him into a shop during these same years, then the wealth of a community will be increased by having the greatest possible portion of our skilled workmen educated in such schools.

It must not be supposed that technical education has as its only result the increase of wealth of a community. It is also both mentally and morally uplifting. The technically educated man is brought face to face with the laws of nature and the laws of nature are the laws of truth. A man cannot be a good technical student unless he is honest with himself and if he is honest with himself he cannot be false to any man.

The late Abram S. Hewitt in a notable address in the year 1890 stated that the invention of Bessemer steel was one of the great events which had changed the face of society since the time of the Middle Ages. "The invention of printing, the construction of the magnetic compass, the discovery of America and the introduction of the steam engine are the only capital events in modern history which belong to the same category as the Bessemer process. They are all examples of the law of progress which evolves moral and social results from material development The face of all society has been transformed by these discoveries and inventions."

To these five capital events named by Mr. Hewitt we must now add a sixth: the rapid spread of technical education during the last thirty years. It, like these other events, has transformed the face of society.

[1]An address at the anniversary banquet of the International Correspondence Schools, Scranton, Pa., Oct. 15, 1906.

[2]Dean of the L. C. Smith College of Applied Science, Syracuse University.

COLORADO FUEL DEVELOPMENTS.

For the four months ending Oct. 31 the Colorado Fuel & Iron Co. reports gross earnings of $7,442,298; operating expenses amounted to $6,672,870, and the surplus for the third of the year was $534,994. An additional $2,102,500 common stock has been listed on the New York stock exchange to acquire all the stock and demand notes of the Crystal River Railroad Co. not held by the Colorado Industrial Co. The railroad company owns 18 miles of line between Carbondale and Placita, Colo., and 12 miles of narrow gauge road connecting with coal properties of the Colorado Industrial Co., at Cool Basin. The railroad also owns one-half of an issue of $300,000 stock of the Redstone Improvement Co., which is the owner of real estate, water works, hotels, etc., at Redstone, where are located the coke operations of the Colorado Fuel & Iron Co.

Public Mineral Lands.—Congress is directing much attention to the question of leasing public lands containing mineral deposits. Senate bill No. 7377 provides that where lands reserving title to mineral deposits have been conveyed by the United States, the parties holding leasing contracts shall pay the owners of such land a reasonable compensation for the use of land occupied in the mining and using of such deposits. Another bill (S. 7241) dealing with another phase of this subject, requires that title to these deposits found within the public domain shall always remain in the United States.

During the past year exports to Panama aggregated slightly more than $14,000,000, exclusive of those products carried by government transports or naval vessels. The largest item was for locomotives and railway equipment, slightly more than $2,500,000. Pipes and fittings were sent to the value of $500,000; rails $318,000, and structural steel $93,000.

GREAT PROSPERITY OF THE PITTSBURG DISTRICT.

LAST HALF OF 1906 REMARKABLE FOR NEW RECORDS.

Only a Slight Lull During the Summer.—New Open Hearth Construction an Important Feature.— Iron Ore Scarce.

By W. B. Robinson

The year which has just come to a close will go down in the history of the iron and steel business as one of prosperity and one of almost continued progress in practically every line and product. Never before has there been such a demand for the material, nor has there ever been the big production which has marked the output from mines to mills during 1906.

The year began prosperously, and with the exception of a slight lull during the early summer months, each month has been a little better than its predecessor, and each one, particularly during the latter half of the year, a record breaker, not only in the specifications against contracts, but also in new business and tonnage output. There have been times during the year when the mills have been a little slack as regards business ahead of them, but at no time has there been any danger of insufficient business in order to keep in operation to full capacity. This condition of affairs in some of the finished lines is due to the fact that additional finishing capacity has been installed, and the actual business ahead of mills has been kept down proportionately, but has been well distributed, and had it not been for this increase in production, the end of the year would have seen an unprecedented tonnage of unfilled orders on the books for delivery next year. As it is, finished lines, with possibly one or two exceptions, have work ahead as far as producers care to figure on the future. As a matter of fact, several branches of the finished trade are heavily oversold, and if the entire tonnage of contracts is specified against, there will be no diminution in operation until considerably after the middle of the year. By the time that period is reached, enough additional business is expected to carry through the year.

Scarcity of Crude Steel.

Beginning at the very opening of the year, there has been a scarcity of semi-finished material—billets, sheet bars and slabs—and the output of the leading producers toward the latter part of the year has been so inadequate that independent manufacturers, depending upon the open market for their supply of raw material, have been seriously handicapped on this account. Far-sighted consumers of semi-finished material early in the year anticipated this condition of affairs, and the result has been an unusual amount of new construction, particularly in the number of open-hearth furnaces in the smaller plants.

Popularity of the Open-Hearth.

Probably the most important single development in the steel business during the year is the increase of demand for open-hearth material, and in October the Steel Corporation announced its intention ultimately to abandon the Bessemer process at its Duquesne plant, and in its stead erect eighteen 50-ton open-hearth furnaces. This, with the largely increased open-hearth capacity at the Homestead plant, and an appropriation for similar capacity at the Ohio works of the Corporation at Youngstown, is a fair intimation of the trend of the business. It may indeed safely be said that the leading interests will install no further Bessemer converting plants, and it is predicted that by 1912 existing Bessemer plants will have been replaced by open-hearth furnaces. The Jones & Laughlin Steel Co., the largest independent interest in Pittsburg district, has also decided to install four Talbot open-hearth furnaces upon the site of its new plant on the Ohio river below Pittsburg. In addition to this, smaller concerns throughout the district and in other sections of the country are installing only the open-hearth process, and the increasing popularity of the process is further demonstrated by the fact that the Steel Corporation will have nothing but open-hearth furnaces at its new plant at Gary, Ind. The only new Bessemer plant in this district is that of the Youngstown Sheet & Tube Co., Youngstown, O.

Scarcity of Iron Ore.

The early months of the year, before the opening of navigation on the lakes, were marked by a scarcity of ores for merchant furnaces, and the strike of longshoremen at Lake Erie ports delayed the movement to the furnaces for some time after the boats began to arrive with cargoes at the lower end of the route. This trouble was adjusted satisfactorily and a long term contract entered into and danger of a similar tie-up was obviated for several years to come. In this connection it may be said that inability to secure ores has been preventing the construction of additional blast furnaces and the scarcity of pig iron, felt so badly toward the end of the year, and for delivery during the first half of next year, will be felt again, if the present increase in the rate of consumption continues. There is absolutely no reason to believe it will not do so.

Increased Pig Iron Production.

The unfailing indication of general prosperity in the iron and steel business is a very heavy increase in the production of pig iron. With this increased production, prices have been maintained and during the last six months of the year steadily advanced. The production of pig iron for 1906 will be over 25,000,000 tons in round figures against 23,000,000 tons in round figures in 1905. In 1904 the production was 16,500,000 tons; 1902 and 1903 approximately 18,000,000 tons each year. There are no stocks at the furnaces at the close of the year, except where, as in the south, railroads have been unable to haul the iron as promptly as it has been sold. The fact that the demand has been greater than the large output of 1906 is indicative of general activity throughout the iron and steel business. Most of the output has been disposed of on a rising market in spite of the heavier production. The year just closed adds another to the period now nine years old, in which there has been a steady increase in production, except one off year, 1904.

Pig Iron Prices.

June was the low-water mark as far as prices on pig iron were concerned, there having been a gradual decline from month to month from the first of the year, and each month after June showed the visible supply gradually decreasing, until at the end of the year it was practically impossible to secure iron for prompt delivery. The buying began several months earlier than is usual for pig iron. Before the close of the third quarter, the available supply for the first quarter of the next

year had been sold and big inroads made into the second quarter supply. The tonnage of southern iron brought north, or sold on contract, reached big figures on account of the sold-up condition of the northern market.

Finished Material Prices.

In finished lines prices were practically even during the year, with the exception of the last two months, and these reasonable prices undoubtedly had a great deal to do with the immense volume of business done, prices of finished material not being at all in proportion to the high cost of raw and semi-finished materials. Steel bars and plates took an early lead during the latter part of the year, and before its close producers were sold to capacity through a large part of the first half of next year and selling rapidly into last half of 1907. Structural material was easier on account of the increased productive capacity. A conservative estimate of this new capacity is 2,000 tons a day.

The lake ship yards, steel car interests and pipe makers early loaded up the plate mills, the former being filled to their capacity for new construction during 1907 and having on their books boats for 1908 delivery. The steel car companies in this district alone have built upwards of 55,000 steel freight cars and about 3,000 steel under frames, aside from electric and steam railroad coaches.

The question of new railroad carrying capacity brings up one of the most serious obstacles confronted by manufacturers during the year, this being the extreme car shortage in all parts of the country, which prevented the shipment of finished product, and also seriously handicapped mills on account of inability to secure their usual supply of raw and semi-finished material.

Little Labor Disturbance.

There has been little serious labor trouble during the past year, although the strike of bituminous coal miners for a short time was an important question and the demand of molders for wages in advance of those paid in competing districts for a time looked as though it might be serious. Both of these troubles were avoided, and with them out of the way, there has been practically no set back on account of labor difficulties; in fact, there have been several voluntary advances, notably by the United States Steel Corporation, followed by other interests.

The sheet and tin plate business has been exceptionally prosperous during the year under review and prices have advanced three times on black and galvanized roofing; twice on painted roofing; and tin plate has advanced four times, from $3.40 at the opening of the year to $3.90 at the close. Business on the books at the end of the year is heavier by far than at any similar period since the organization of the American Sheet & Tin Plate Co., and while no actual figures are obtainable at this time, the output of sheet products will be very close to 1,200,000 tons. The end of the year finds practically no stocks on hand. Steel bars remaining stationary at 1.50c base Pittsburg until November, when they were advanced to 1.60c base; and structural material during the year was sold at 1.70c base Pittsburg; steel plates were not advanced from 1.60c to 1.70c until the latter part of November. Standard rails were stationary at $28.00 and light rails showed a gradual advance from July to December, remaining practically stationary during the first six months. Bar iron showed the greatest fluctuation in prices of any of the steel products; opening the year at 2c, shading to 1.55c in June and July, advancing to 1.60c in August, remaining at that figure until October, averaging 1.75c in November and 1.80c in December; these averages being arrived at on the basis of weekly prices for the month.

Wire Products Active.

Wire products had an unusually active year and with the exception of the usual summer shut-down in July for repairs, mills were operated to capacity throughout the year. Prices were very firm, opening in January at 1.85c and closing in December at $2.00 on wire nails, with the usual differentials on other products. Ferro-manganese was the most variable of raw materials, opening at $175.00 per ton in January, shading down to $79.00 in June and closing the year at $82.50 as an average for December.

The demand for both furnace and foundry coke was exceptionally heavy, with prices varying, as is usual with coke. The lowest prices were in the middle of summer, advancing to the winter months, with spot coke in December selling at $3.60 for furnace and $4.00 for foundry coke, as compared with $3.00 for furnace and $3.25 for foundry coke during the first month of the year.

Engineers in New Home.—Both the American Society of Mechanical Engineers and the American Institute of Mining Engineers are now located in the new United Engineering Society building, 29 West Thirty-ninth street, New York, where it is requested that all communications, mail and express matter, be directed.

THE UTAH STATE SCHOOL OF MINES.

The Utah State School of Mines is the engineering department of the State University. It was formally established as a part of the latter institution in 1901 by an act of the state legislature, although the school was in operation previous to this time, it having been announced in the Utah University catalog as a department of the institution as early as 1891-92.

The school of mines now offers five engineering courses. They are mining, electrical, civil, mechanical and chemical engineering. Each course leads to a degree and requires four years for its completion. The aim is to qualify the student for the duties of the practical engineer in connection with the mining industry of the intermountain region. This industry in its varied phases demands the services of specialists in every line of engineering. The courses offered in the School of Mines have been carefully arranged with the view to making such specialists.

The facilities that the school now possesses with its excellently equipped laboratories, its competent faculty, and its location in the very heart of a great mining and metallurgical region, are equaled by few engineering schools in the country.

The demand for the services of specialists in the many branches of the mining industry is so great that the graduates of the School of Mines find no difficulty in securing desirable positions directly upon the completion of their courses. The ambitious young man now sees that he has bright prospects before him in taking up an engineering course in the institution; and for best results he should study mining in a mining country. Thus students from the east are in many cases going to the western school for their special preparation in the profession of mining engineering.

Every year finds more students from outside the state applying for entrance to the Utah State School of Mines. Some of these young men have done part of their engineering coures elsewhere and desire to complete their course in this institution; while others are college graduates who come west for their special preparation in the work of the mining engineer.

There are now registered in the courses in engineering 165 students of college grade, a decided increase over former years notwithstanding the recent raising of the entrance conditions.

THE PNEUMATIC PYROMETER.

The pneumatic pyrometer is valuable, not only because of its accuracy, reliability and durability, to the blast furnaces in the United States, 75 per cent of which are equipped with this instrument, but as much, and in some instances even more because it makes an exact and continuous autographic record of the temperature measured.

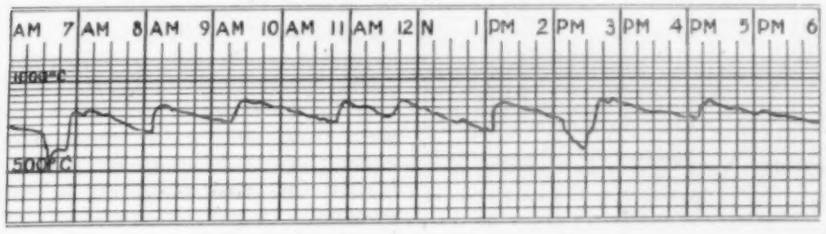


FIG. 1.—HOT BLAST TEMPERATURE RECORD.

This is of utmost importance in all operations where heat is a controlling factor. It furnishes the superintendent with a continuous unbiased exposition of what has transpired in the way of temperature, from which he can not only learn whether his instructions have been carried out, but in addition many other facts and conditions.

In connection with a blast furnace the double instrument is the one in general use, indicating and recording the temperature of both blast and gas. The blast record shows not only the correct temperature of the air entering the furnace, whether the stoves were changed at proper intervals, how each individual stove holds its heat, its initial and final temperature while on blast, etc., but it also shows every stop, when it occurred and its duration,

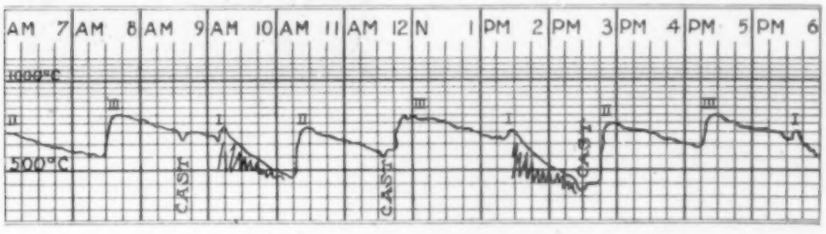


FIG. 2.—ANOTHER HOT BLAST TEMPERATURE RECORD.

and last but not least the record reveals the exact condition of each stove.

Fig. 1 and Fig. 2 are typical hot blast temperature records from an Austrian furnace and are in the centigrade scale. Fig. 1 shows the stoves in good condition, it also shows that the blast was taken off at 6:30 A. M. and remained off about 22 minutes, and that there was a similar stop between 2:15 and 2:45 P. M. Fig. 2 at a glance reveals the fact that No. 1 stove is in bad order, and that it should be taken off for cleaning and repairs. Short intervals of stops are shown between 8:30 and 8:45 and between 11:30 and 11:45 A. M. Figs. 3 and 4 are gas temperature records selected from two American furnaces because of their radical difference. Fig. 3 is characteristic of a hand-filled furnace and is a poor example, while Fig. 4 is a very good example of automatic charging. The record in both cases indicates every charge going into the furnace and is therefore a perfect check on the stock-house men.

Every blast furnace man knows that the top temperature rises as the stock is permitted to get low in the furnace, and that high-top temperatures mean waste of fuel. Irregular charging is conducive to hot tops, hence waste of fuel. Temperature curve Fig. 3 shows that the stock-house men indulged in frequent intervals of rest of considerable duration, whereas Fig. 4 shows a regular and continuous filling operation. Largely, if not entirely, in consequence of regular charging, the top temperature of the latter furnace does not average much over 350 degrees, while the furnace giving the record shown in Fig. 3 had an average top temperature of fully 600 degrees. The fuel consumption of these two furnaces was respectively 1,950 and 2,400 pounds of coke per ton of pig iron produced, which bears out the effect of top temperature on fuel economy. The control of the top temperature is, therefore, a most important factor in the fuel economy of a blast furnace, and the knowledge of this temperature as indicated by the pyrometer is quite as important, if not more so than that of the blast temperature.

What is true of its application to the blast furnace, is true even in a much higher degree of the application of an autographic recording pyrometer in every industry in which the quality of the product depends upon the proper control of the temperature involved in its production. It is well

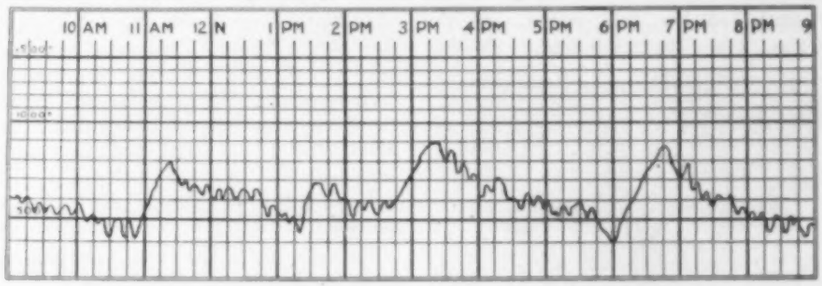


FIG. 3.—HAND FILLED FURNACE RECORD.

known in connection with annealing that the best results are obtained between narrow limits of temperature and that every composition of metal has its own definite temperature range, which cannot be departed from without effecting the quality. As these facts become more and more generally known the need of accurate and reliable means for controlling temperatures, not only in annealing, but in all processes where heat plays an important part, is being more and more keenly felt. The Uehling Instrument Co., of Passaic, N. J., has recently developed the pneumatic pyrometer into a multiple form, and is prepared to furnish them in systems of four, six, etc., up to twelve units. Fig. 5 shows a system of eight pyrometers, capable of indicating and recording simultaneously temperatures at eight different points which may be located 500 feet apart, the main instrument and recorders being placed in some convenient central location.

A feature of great importance, peculiar to the pneumatic pyrometer, is, that it will not only record the tem-

perature at any convenient place, but can be so installed that it will at the same time indicate this temperature at any other place, where such indication may be necessary or desirable. Thus, for instance, the furnace attendant may have the temperature in-

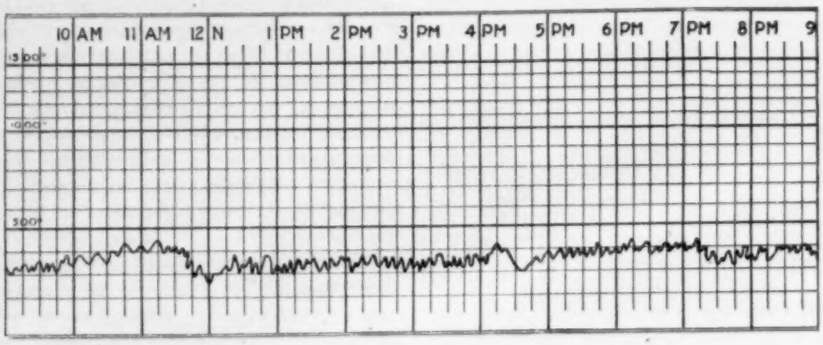


FIG. 4.—FURNACE RECORD WITH AUTOMATIC FIRING.

dications of his furnace or furnaces within convenient view, while the same is simultaneously shown in the "shack" of the boss heater and the office of the superintendent, if the lat-

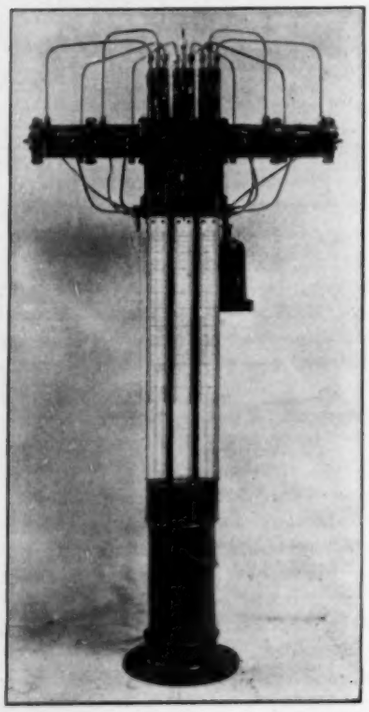


FIG. 5.—GROUP OF PYROMETERS.

ter places are within reasonable distance from the furnaces.

The records of this pyrometer are traced on rectilinear charts, which form it is claimed has advantages over the circular form of chart, so largely employed. On a rectilinear chart the whole record can be seen at a glance. while two or more records can be very conveniently compared

RAILWAY WORK CURTAILED.

M. S. Connors, general superintendent of the Hocking Valley and Ohio Central railways, says the companies he represents will not make as extensive improvements during the coming summer as were made last year, owing to the scarcity of labor. Many of the plans for improvements that were to have been made last year had to be abandoned because the necessary labor was not available. In preparing his recommendations relative to future improvements, Mr. Connors will have the labor situation of last summer in mind and will recommend only such improvements as will be practically necessary for the maintenance of good service.

By a recent order of the Ohio railway commission, 3,200 freight cars of the Hocking Valley were thrown out of service. About 30 days ago Mr. Connors petitioned the commission for an extension of the time, specified for the law to go into effect, requiring 75 per cent of the cars of all freight trains to be equipped with air brakes, and the extension was granted. A rehearing was ordered, however, on the request of Grand Master Morrisey of the Brotherhood of Railway Trainmen and on the representation of Mr. Morrisey that the extension of time would endanger the lives and limbs of the trainmen in the employ of the Hocking Valley, the former order was withdrawn The law became effective last September and the extension granted was until next March. The company has 3,200 cars that are not equipped with air brakes. These are being rapidly replaced by an order of 4,000 freight cars that are being turned out by the Ralston Steel Car Co. The action of the commission practically puts the old cars out of service at once, instead of allowing them to be used until the new cars are received.

The Hocking Valley and Ohio Central systems have placed orders with the American Locomotive Co. for 1907.

SKETCH OF FRANK H. TAYLOR.

Frank H. Taylor, recently elected to the directorate of the Yale & Towne Mfg. Co., has been chosen a vice president of the company. He was born in Cincinnati and was educated at Haverford college and Harvard university. For a time he was employed in Cincinnati, but in 1882 removed to Philadelphia, where he was one of the organizers and then treasurer of the Belmont Iron Co., of which he ultimately became president. When the plant was destroyed by fire Mr. Taylor in 1890 became manager of the Philadelphia branch of the Yale & Towne Mfg. Co., continuing in that capacity for seven years. In 1897 he became sales manager of the Westinghouse Electric & Mfg. Co.; three years later he was promoted to fourth vice presidency, and later became second vice president. He is still a director of that company, of the Provident Life & Trust Co., Philadelphia, and a trustee of the Engineers' club, New York. His duties as a vice president of the Yale & Towne Mfg. Co. will relate equally to the manufacturing and commercial sides of the business and ul-

FRANK H. TAYLOR.

timately will include many of the matters heretofore attended to by the president.

Schonthal Improvements. — The Schonthal Iron & Steel Co., Columbus, O., is planning for a number of improvements to be made early in the spring that will materially increase the capacity of its plant. Its yards will be increased by about 1,000 feet of new track, connecting with the T. & O. C. railroad. Considerable new machinery has been ordered, notably a large shear that will be capable of cutting up to six inches square. The plant has four shears now in operation.

Iron Trade Chronology For 1906.

January 1.—Ohio mill at Youngstown put on sheet bars after a six months' run on rails.

2.—C. W. Bray succeeds John A. Topping as president of the American Sheet & Tin Plate Co., Mr. Topping becoming executive head of the Republic Iron & Steel Co., and later of the Tennessee Coal, Iron & R. R. Co.

2.—Carnegie Steel Co. advanced light rails $1.00 a ton, making the price $28.00 on 25-45 pound sections.

8.—Black sheets advanced $2.00 a ton to 2.40c; galvanized $2.00 per ton to 3.45c; galvanized corrugated roofing 10c to $3.00; painted corrugated unchanged at $1.65; tin plates 10c to $3.50. The last similar advance on sheets and tin plates was Nov. 20, 1905.

8.—Wire products advanced $1.00 per ton, making wire nails $1.85; plain wire 1.70c; galvanized barb wire 2.30c. Previous advance was $1.00 on Oct. 2, 1905.

8.—Carnegie Steel Co. announced addition of two blast furnaces to the Carrie group at Rankin, Pa.; ten 50-ton open-hearth furnaces at Homestead, and rebuilding of three structural mills and new plate mill at Homestead.

8.—Illinois Steel Co. advanced light rails 50c a ton to $28.00 in carloads. $27.00 in larger lots, sections 30 to 45 pounds.

15.—New Mingo furnace. Carnegie Steel Co. blown in.

15.—Steel Corporation buys 50,000 tons Bessemer pig iron from valley interests; 25,000 tons from W. P. Snyder & Co., both at $17.25 valley flat for first quarter; 40,000 tons from W. P. Snyder & Co. for second quarter at $17.75 guaranteed against decline. Furnaces refused to sell second quarter guaranteed against decline except at $18.00.

16.—Plate makers advance prices on plate to Pacific coast $4.00 a ton, or from 1.40c to 1.60c base, the same as to local consumers.

18.—Pittsburgh Steel Co. closed five-year contract for 350,000 tons coal annually for five years; Midland Steel Co. for 250,000 tons annually for the same period.

22.—National Tube Co. sold fifty miles of eight-inch pipe to the Union Oil Co., San Francisco, for line across the Isthmus of Panama. Eighty-five miles of 18-inch pipe to the Ohio Fuel Co. for line from Cincinnati to Columbus divided between National Tube Co. and Spang, Chalfant & Co.

24.—New No. 7 furnace, Cambria Steel Co., Johnstown, Pa., blown in.

February 1.—Colonial Steel, Pittsburg, decides to install two 25-ton basic open-hearth furnaces.

2.—Marine boiler steel advanced 2c extra to 4c extra on account of stringent regulations of government inspection service.

9.—Hoops advanced $1.00 a ton to 1.90c; previous advance $2.00 Nov. 27, 1905.

15.—Steel Corporation exercised option, taking 16,000 tons Bessemer pig iron from valley interests for quick shipment to Chicago at $17.25 valley.

March 1.—Southern freights on pig iron advanced 25c to Ohio river points, making freights: Birmingham to Cincinnati $3.00; to Pittsburg $4.60; to Chicago $3.90.

5.—Sharp decline in bar iron $3.00 per ton within a week to 1.65c f. o. b. Youngstown, O.

13.—Bi-monthly bar iron wage settlement showing 1.6c, an advance of a tenth.

17-18.—General offices of the Republic Iron & Steel Co. moved from Chicago to Pittsburg.

18.—Ohio mill at Youngstown changed from sheet bars to rails.

19.—Cotton tie price fixed at 85c per bundle, same as previous year.

20.—Monthly quarterly prices Carnegie Steel Co. on sheet bars announced at $28.00 for long lengths, an advance of $2.00 on quarterly price.

April 2.—Option by La Belle Iron works on Pope Tin Plate Co. plant, Steubenville, not exercised.

2.—Carnegie Steel Co. advanced light rails 25 to 45 pounds $1.00 per ton to $29.00, leaving lighter sections unchanged.

2.—Riter-Conley Co. secures contract for the two new blast furnaces at the Carrie group.

9.—New structural mill, Jones & Laughlin Steel Co., started.

9.—Steel Corporation bought 15,000 tons Bessemer pig iron, April delivery, from valley interests at $17.25.

9.—Tin plates advanced ten cents per base box to $3.60.

20.—C. B. & Q. R. R. and two of its officials fined $60,000 at Chicago for giving rebates to Steel Corporation on tin plate.

1.—Four Duquesne blast furnaces break world's record in March, 78,128 tons, against previous record of Edgar Thomson plant, 77,142 tons.

14.—Agricultural implement makers allowed 1.40c base on steel bars.

May 3.—New No. 3 Isabella furnace, of Corporation, blown in.

7.—Contracts awarded for four blast furnaces at the Gary plant of the Corporation.

7.—Rail sales for 1907 delivery made six months earlier than usual at $28.00 on standard sections. Southern mills open books earlier at $1.00 advance.

18.—Tin plates advanced 15 cents base box to $3.75.

June 5.—Black galvanized sheets advanced $2.00 per ton, and painted corrugated roofing 10 cents a square.

20.—Prices on sheet bars for third quarter announced at $29.00, an advance of $1.00.

July 2.—Tennessee Coal, Iron & R. R. repurchased the Birmingham & Southern R. R. from the Louisville & Nashville and Southern roads. President Topping succeeds J. G. Moore as president.

9.—First heat from new No. 4 open-hearth department, Carnegie Steel Co. at Homestead, poured. First drawing of this plant made Jan. 9, ground broken Jan. 15, making record of 25 weeks from breaking of ground to pouring of steel.

12.—Bar iron wage settlement showed 1.5 cent, a decline of a tenth of a cent.

August 4.—Eastern Steel Works within past two weeks bought about 150,000 tons basic pig iron.

13.—Connellsville coke centennial opens.

14.—About 100,000 tons Bessemer pig iron sold within last ten days at $17.75 valley for first half delivery.

20.—Monthly sheet bar prices advanced $1.00 to $30.00.

20.—Carnegie Steel Co. advanced light rails $1.00 to $31.00

23.—United Engineering & Foundry Co. secures contract for one continuous rail mill for Indiana Steel Co. and a rail tract for one continuous rail mill for Indiana Steel Co. and a rail mill and 28-inch structural mill for Bethlehem Steel Co.

September 1.—Charles Hart resigns as general manager southern division of the Republic Iron & Steel Co. to become president of the Inland Steel Co., Chicago.

6.—New blast furnace, Midland Steel Co., blown in.

12.—Carnegie Steel Co. announces intention to build new billet mill at Donora plant.

20.—Quarterly price on sheet bars announced by Carnegie Steel Co. at $30.00.

October 5.—Official announcement

of Great Northern and Steel Corporation ore deal.

13.—Merchant pipe advanced two points.

16.—Upwards of half a million tons of furnace coke at $3.00 and over per ton secured by H. C. Frick Coke Co. for 1907 delivery.

25.—Carnegie Steel Co. announced two new blast furnaces and eighteen open-hearth furnaces at Duquesne plant and the abandonment of present Bessemer plant when these are completed. New 16-inch merchant mill to be erected and 10-inch mill moved from Monessen to Duquesne.

25.—Tin plate advanced 15c per base box, black and galvanized sheets $2.00; blue annealed $1.00; corrugated painted roofing 10 cents; galvanized sheets 5 cents.

November 1.—Jones & Laughlin Steel Co. announces plans to erect four blast furnaces and six Talbot open-hearth furnaces on the site of their new Allequippa plant.

1.—Bar iron advanced to 1.70c base, Pittsburg.

2.—Ore prices for 1907 fixed at 50 cents advance on non-Bessemer, and 75 cents on Bessemer, basis of iron content being reduced.

2.—La Belle Iron & Steel Co. at Steubenville, O., announced contract for two new jobbing mills and eight new sheet mills.

1.—Carnegie Steel Co. broke seventy-one productive records during October.

4.—Light rails advanced $1.00 per ton.

7.—Hoops advanced $2.00 per ton to two cents base.

10.—Wire products advance $1.00.

15.—Steel bars advance $2.00 per ton to 1.60c base.

22.—Heavy sales of malleable Bessemer pig iron for last half delivery.

26.—Steel plates advance to 1.70c, Pittsburg, although leading interest has not withdrawn 1.60c base, but is not accepting new business.

December 1.—Angle splice bars advance $3.00 to 1.65c.

3.—Wire products advance $2.00 a ton, making nails 2c base.

5.—Merchant steel pipe advanced one point.

12.—Seneca Iron & Steel Co., Buffalo, lets contract for new sheet mill.

21.—Merchant pipe advanced one point, this practically restoring prices of April, 1905.

20.—Boiler tubes advanced $4.00 per ton, or two points, partially restoring prices of April, 1905.

22.—Hazelton No. 3 furnace, Republic Iron & Steel Co., blown in.

ELECTRIC FURNACE METHODS OF IRON AND STEEL PRODUCTION.—VII.

By John B. C. Kershaw.

Yield and Costs.

A very large number of figures for the yields and costs of the electric furnace methods of iron and steel production have been published during the last six years, and the practical metallurgist in search of correct information is likely to be somewhat dismayed by the mass of statistics, and by the great variations which are found on reducing these figures to a common basis of comparison.

It is necessary to remember however that many of the figures are only estimates, and that these do not possess the value or weight of figures based upon actual trial of the processes. Again, the variations in the cost of electric power in different localities, and the different methods of working the electric furnace for iron and steel production, all contribute to the variations in the cost per ton of finished steel. The consumption of electric power and the total costs are of course highest in those cases in which the process is worked as a reduction process, and the raw materials, iron ore, lime and coke, are charged into the furnace without any preliminary heating. On the other hand the consumption of electric power and total costs are lowest when the process is conducted solely as a refining process, and molten pig iron from the blast furnace is used as raw material in the electric furnace. Between these two extremes there are many intermediate values, due to modifications in the methods of conducting the process and in furnace design. In the following pages, an attempt will be made to discriminate between figures of weight and those of little value. Comparisons between yields and costs for different furnaces and processes will only be made, when the conditions under which the trials were carried out are similar in character, and a fair comparison is possible.

The furnaces and processes will be dealt with in the order followed in Articles II and VI of this series, the authority for the figures being given in brackets after the same:

The Heroult Furnace and Process.

(a) Steel production—from pig iron and scrap charged cold into crucible type of furnace with carbon electrodes.
Trial No. 1. 882 kilowatt hours per metric ton. (Goldschmidt).
Trial No. 2. 1,000 kilowatt hours per short ton. (Canadian Commissioners).
Trial No. 3. 1,000 kilowatt hours per short ton. (Canadian Commissioners).
Trial No. 4. 653 kilowatt hours per short ton. (Canadian Commissioners).

The quality of steel produced in No. 1 trial was not stated,—in No. 2 a dead soft steel was produced,—in No. 3 a hard tool steel; and in No. 4 trial a steel adapted for structural purposes.

(b) Steel production from scrap—melted and over-oxidized in an open-hearth furnace.
Trial 1. 360 kilowatt hours per metric ton. (Eichoff).

This trial was made at the Remschied works in Germany,—the quality of steel produced was not stated.

(c) Pig iron production.
Trial No. 1. 3,080 kilowatt hours per short ton. (Canadian Commissioners).
Trial No. 2. 2,306 kilowatt hours per short ton. (Haanel).
Trial No. 3. 2,342 kilowatt hours per short ton. (Haanel).

The iron produced in No. 1 trial was a close grained gray pig,—in No. 2 a gray iron—high in carbon and silicon,—and in No. 3 trial a similar iron containing between 3 per cent and 4 per cent of nickel.

A large number of other figures have been published for the Heroult process, but these are mere estimates and lack the weight of the above results. They are therefore omitted from this comparison. Taking the mean of the above values for each product we have the following figures for the Heroult process and furnace:

(1) Steel from cold pig and scrap. 864 kilowatt hours per 2,000 lbs
(2) Steel from molten open-hearth steel. 329 kilowatt hours per 2,000 lbs.
(3) Gray pig iron from ore. 2,693 kilowatt hours per 2,000 lbs.
(4) Ferro-nickel pig from ore. 2,342 kilowatt hours per 2,000 lbs.

The Keller Furnace and Process.

(a) Steel production from ores and slagging materials charged cold.
Trial No. 1. 2,800 kilowatt hours per metric ton. (Goldschmidt.)

(b) Steel production from pig iron charged cold.
Trial No. 1. 730 kilowatt hours per short ton. (Canadian Commissioners).

(c) Pig iron from ore and slagging material charged cold.
Trial No. 1. 3,110 kilowatt hours per short ton. (Canadian Commissioners).
Trial No. 2. 1,475 kilowatt hours per short ton. (Canadian Commissioners).

In No. 1 trial, a gray pig containing a considerable percentage of silicon and manganese was produced,—in No. 2 trial a pig suitable for steel manufacture by either the acid Bessemer or Siemens process. The great difference in power consumption was ascribed to a change of furnace, and to inaccurate estimation of the weight of unused ore.

(d) Steel from molten pig.
Trial No. 1. 694 kilowatt hours per metric ton. (Neumann).

Arranging these figures as before, we have the following yields for the Keller furnace and process:

(1) Steel from cold pig and scrap. 730 kilowatt hours per 2,000 lbs.
(2) Steel from molten pig. 631 kilowatt hours per 2,000 lbs.
(3) Gray pig iron from ore and raw materials charged cold. 2,292 kilowatt hours per 2,000 lbs.
(4) Steel from ore and raw materials charged cold. 2,800 kilowatt hours per 2,000 lbs.

The Kjellin Furnace and Process.

Steel from pig iron and scrap charged cold.

Trial No. 1. 970 kilowatt hours per metric ton. (Goldschmidt).
Trial No. 2. 966 kilowatt hours per metric ton. (Neumann).
Trial No. 3. 757 kilowatt hours per short ton. (Canadian Commissioners).
Trial No. 4. 947 kilowatt hours per short ton. (Canadian Commissioners).

No details are available relating to the character of the steel made in trials No. 1 and 2. Sample No. 3 contained 1.08 per cent carbon, 0.194 per cent of silicon and 0.24 per cent of manganese,—while No. 4 contained 0.417 per cent of carbon, 0.145 per cent of silicon and 0.110 per cent of manganese. Owing to the lower temperature attained as compared with the Heroult process, the purity of the product depends largely upon the purity of the raw materials charged, and there is no burning out of the impurities as in the latter process. The Kjellin furnace and process are not adapted for the production of pig iron or steel direct from the ores. No trials have yet been made using molten pig for charging in place of cold materials.

Taking the average of the figures given above, we have the following value:

(1) Steel from cold pig and scrap, 866 kilowatt hours per short ton.

The Stassano Furnace and Process.

Steel from ore, coke and lime charged cold.

Trial No. 1. 2,866 kilowatt hours per metric ton. (Goldschmidt).
Trial No. 2. 3,155 kilowatt hours per metric ton. (Neumann).
Trial No. 3. 3,230 kilowatt hours per metric ton. (Stassano).

No details of the character of the iron produced in these trials are available. The purity of the product depends largely upon the purity of the materials used.

(b) Steel from scrap charged cold.

Trial No. 1. 1,360 kilowatt hours per metric ton. (Stassano).
Trial No. 2. 1,200 kilowatt hours per metric ton. (Stassano).

No figures relating to the character of the steels produced in these trials are available,—owing to the high temperature of the arc and the closed furnace the product is similar to that obtained in the Heroult furnace.

Taking the averages of the above figures we have the following:

(1) Steel from ore, coke and lime charged cold. 2,804 kilowatt hours per short ton.
(2) Steel from scrap charged cold. 1,164 kilowatt hours per short ton.

The Gin Furnace and Process.

So far as the writer is aware, no practical results based on trials of this furnace and process have been published, and the figures given in the somewhat voluminous papers and reports prepared by M. Gin, are mere estimates based on study of theoretical data. For this reason, the figures for the Gin furnace and process are less important than those previously dealt with, and only one estimate will be given,—namely for

(a) Steel from molten pig iron. 680 kilowatt hours per metric ton, which is equivalent to 618 kilowatt hours per ton of 2,000 lbs.

The Girod Furnace and Process.

This furnace and process have received actual trial and the following figures are based upon the result:

(a) Steel from scrap charged cold.

Trial No. 1. 1,060 kilowatt hours per metric ton.
Trial No. 2. 1,440 kilowatt hours per metric ton.
Mean. 1,136 kilowatt hours per ton of 2,000 lbs.

No details of the character of the steel produced in these trials are available.

The Heroult Furnace and Process.

(a) Steel from ore in combined reduction and refining type of furnace, the ore and other raw materials being heated by the waste heat from the later stages of the process.

Estimate No. 1. 1,837 kilowatt hours per metric ton.
Estimate No. 2. 2,646 kilowatt hours per metric ton.
Mean. 2,242 kilowatt hours per metric ton.
Equivalent to 2,038 kilowatt hours per ton of 2,000 lbs.

Combining the results set out above in one group for purposes of comparison, we have the following:

	I Heroult	II Keller	III Kjellin	IV Stassano	V Gin	VI Girod	VII Harmet
Steel from scrap and pig (charged cold)	864	730	866	1,164	...	1,136	....
Same (charged hot)	320	631	...	....	618	....	....
Pig iron from ore, coke and lime (charged cold)	2,693	2,292	...	....	...	....	....
Same (charged hot)	...	...	...	....	...	....	....
Steel from ore, coke and lime (charged cold)	...	2,800	...	2,804	...	...	1,038
Nickel pig from ore	2,342	....	...	....	...	....	....

(Note to Table.—All results in K. W. hrs. per ton of 2,000 lbs.).

These figures show that as regards the manufacture of steel from scrap and pig iron, charged cold, the Heroult, Kejellin and Keller furnaces all yield results in the neighborhood of 800 kilowatt hours while the Stassano and Girod furnaces have a power consumption 50 per cent higher. The Heroult and Keller furnaces and processes are able to deal with more impure materials than the Kjellin furnaces, since the use of the electric arc as source of heat, produces a much higher temperature than induction heating, and this enables all the impurities of the raw iron to be oxidized and removed in the slags. On the other hand the Kjellin furnace and process gain by the absence of carbon electrodes, and by the generation of heat entirely within the material contained in the furnace. The costs of operating and of maintenance are thus greatly reduced, and this saving balances the higher expenditure upon raw materials. It is however probable that each type of furnace will be found adapted for the production of steels of special quality, and that both the arc type of crucible furnace (represented by the Heroult and Keller furnaces), and the induction type (represented by the Kjellin and Hiorth furnaces) will attain a permanent position in the steel industry of the future.

The figures given for the power consumption when the steel and scrap are charged into the furnace in the molten condition are hardly comparable, since it is evident that the Keller and Gin trials were made under conditions dissimilar from those obtaining in the Heroult trials. It has been calculated by Neumann that 433 kilowatt hours are necessary to raise one ton of iron to the molten state, and it is therefore certain that when the iron is charged in this condition into the electric refining furnace, a reduced power consumption of 400 kilowatt hours per ton of steel produced should be obtained. The figure given by Eichoff for the working of the Heroult process at Reimscheid, namely 329 kilowatt hours, may possibly be too low, but working under these conditions a power consumption of only 410 kilowatt hours per ton of steel produced should be attainable.

This reduction of 50 per cent in the electric power required is so important, that it is evident the development of electric furnace work in the iron and steel industry in the near future, must proceed along these lines. At Reimscheid in Germany, and at Syracuse, N. Y., Wellman open-hearth furnaces are being employed for the preliminary heating of the metal, in order to obtain an over oxidized product as raw material for the electric refining furnace. The next step will be to dispense with this

intermediate furnace process, and to transfer the pig iron, as it runs in the molten condition from the blast furnace, directly to the electric crucible furnace for the final refining operation. The writer prophesied this development some years ago, and he still expects to see it realized.

The figures for the power consumption when the electric furnace is employed to reduce the ores and to produce pig iron or steel in one operation are less hopeful than those given above. For pig iron production the power consumption appears to lie between 2,300 kilowatt hours and 2,700 kilowatt hours, these figures being for the materials charged cold, and a reduction of between 300 and 500 kilowatts being possible, if the raw materials are partially melted before bringing under the heating action of the electric current. It is improbable however, that the electric power required for producing iron or steel from the ores, even with preliminary heating of the ore and other raw materials, can be reduced below 2,000 kilowatt hours per short ton of metal. It will be shown in the final section of this article, that power would have to be obtained at a very low cost, to render competition with the ordinary blast furnace procedure practicable on this basis.

The use of the electric furnace for iron ore reduction is therefore in the writer's opinion not likely to undergo any industrial development at present, excepting under very special conditions. In some case it may prove possible by use of electric furnace methods to manufacture iron or its alloys out of ore deposits which are otherwise unworkable, and in these cases, the new methods of heating will of course find early application. The attempts to smelt New Zealand iron sand, and the titaniferous ores of America are examples of this use. The trials of the Heroult furnace and process at Sault Ste. Marie in Canada are reported to have led to a similar result, for the plant which is to be erected as the outcome of these trials, is to be used for the smelting of nickel iron ores, and not for the production of ordinary pig iron.

In countries like Norway and Switzerland with abounding water power that can be developed at very low cost, it is possible again that a native iron smelting industry might be established, if iron ore and lime are found in the locality of the water power. But here again special conditions will be required to render the industry a financial success,—and it is unlikely that the iron will be able to compete in price with the product of the ordinary blast furnace in the open market. Until the coal fields of Europe and America are more nearly exhausted than at present, the electric furnace methods of iron smelting will therefore in the writer's opinion undergo little development. It is in the production of special steels and alloys in the electric refining furnaces, that the greatest progress is likely to occur within the next few years. That an electric iron smelting industry will some day be established the writer does not deny,—but the conditions at the present time are not favorable to its early development,—and they are hardly likely to be so for another 20 or 50 years.

Costs.

The figures for the costs of working the various electric furnaces and processes for iron and steel production are less reliable than those given in the preceding section of this article, since in practically all cases they are based on estimates rather than upon actual figures.

The cost of ore, lime, coke, and fluxes, and the cost of electric power can of course be obtained with exactitude for the various processes and localities,—but such important items as electrodes, depreciation repairs, interest on capital, and management are largely unknown charges, and may be greater in the aggregate than is yet realized. The costs of electrodes and repairs are of course highest in the furnaces and processes using arc-heating, and these processes are heavily handicapped by the expenditure upon these two items of running costs. The furnaces and processes using the induction methods of heating, have a striking advantage here,—since the outlay upon electrodes is nil,—and the wear and tear of the furnace structure is small.

In the statement given below, the costs of production as given by the various furnace designers, and by others who have reported upon their working, are set down in the order followed in the first section of this article, but no attempt is made to institute comparisons between the various processes on the basis of these costs, since the variables are too numerous and conflicting. It is for this reason that the discussion upon the future of these electric iron and steel processes has been given at the end of the previous section,—as the figures for power consumption are mostly based on actual trials, and possess a value lacking in those which are given below.

Heroult Furnace and Process.

(a) Steel from scrap. $14.00 per ton of 2,000 lbs. exclusive of cost of scrap, with electric power at $10.00 per electric horsepower per year.
(b) Pig iron from ores. $10.00 per ton (ore at $1.25 per ton).

Keller Furnace and Process.

(a) Steel from ores. $20.00 per ton of 2,000 lbs.
(b) Pig iron from ores. $12.05 per ton of 2,000 lbs.
(Electric power at $10.00 per electrical horsepower per year and ore at $1.50 per ton).

The Kjellin Furnace and Process.

(a) Steel from scrap. $34.00 per ton of 2,000 lbs. (Electric power at $10.00 per electrical horsepower per year).

The Stassano Furnace and Process.

(a) Pig iron from ore. $18.80 per ton of 2,000 lbs. (Electric power at $9.00 per electrical horsepower per year, and ore at $3.60 per ton).

The Gin Furnace and Process.

(a) Steel from molten pig. $16.00 per ton of 2,000 lbs. (Electric power at $12.00 per electrical horsepower per year, and ore at $3.00 per ton).

The Girod Furnace and Process.

(a) Steel from scrap. $5.80 per ton of 2,200 lbs.

The Conley Furnace and Process.

(a) Steel from ore. $11.80 per ton.

The Harmet Furnace and Process.

(a) Steel from ore. $5.60 per ton.

The above figures show such wide variations, that even as estimates they are misleading and unsatisfactory. In attempting to form an opinion as to the comparative cost of working the electric iron and steel processes it is therefore better to rely upon the figures for the power consumption, given in the first section of this article. Taking the estimated horsepower per year at $10.00, and the average power consumptions in Table I, we have the following costs:

(1) Steel from molten scrap. $0.62 (400 kilowatt hours).
(2) Steel from cold scrap and pig. $1.24 (800 kilowatt hours).
(3) Pig iron from ore, coke and lime, (charged cold) $3.87 (2,500 kilowatt hours).
(4) Pig iron from ore, coke and lime, (charged hot) $3.10 (2,000 kilowatt hours).

In the manufacture of best crucible steel, however, it is customary to assume that between 2½ and 3 tons of coke are consumed per ton of steel produced. At the present market price of coke, $4.00, the advantage is therefore on the side of the electric refining furnace.

As regards the electric smelting processes, it is necessary to remember that coke is still required to reduce the oxide of the iron ore to the metallic state, and that the only fuel saved is that used in the blast furnace for heating purposes. In the best modern smelting practice only 1,600 pounds of coke are required per ton of pig iron produced, and of this total 650 pounds are required to reduce the ore. The saving in coke by the electric furnace method of smelting, cannot therefore exceed 950 pounds, or at the present price of coke, $2.00.

These considerations show that the prospects for the electric refining processes are much brighter than those for the electric smelting processes,—since the saving of coke in the latter is too small to balance the large expenditure upon electric power. The horsepower per year would in fact have to be supplied at the extraordinary low cost of $5.00. to compete with the blast furnace.

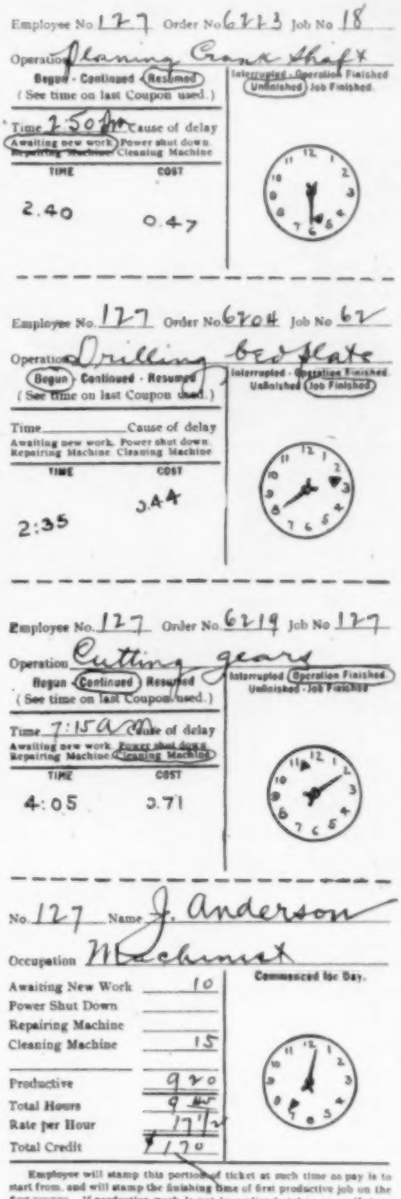
LABOR: TIME SYSTEMS AND PAY ROLL.[1]

F. E. WEBNER.[2]

With a cost system in operation an "in and out" time register is not a prime necessity especially where a register is used for recording time on individual shop orders; under the latter conditions late employes can be required to report to a clerk intrusted with the duty of recording tardiness and the clerks record can be turned daily into the cost office that the time card clerks may know the reason why the full day's time was not accounted for. Where employes quit before the regular time an indication can be made by the employe on the last time report made for the day; this being merely for convenience of cost department and saving further explanations as, on the pay roll, the employe can have credit only for such time as he has reported. If the coupon plan hereinafter explained is adopted then no further in and out time need be required even when tardy.

The most efficient form of time report is one on which the starting time and the finishing time is recorded by a clock or a time stamp which precludes the possibility of prevaricating as is possible under other conditions. The facts are what are most desired and where less time is reported on a job than was actually consumed then some other job has to bear the burden—the time recorder prevents that injustice and records the facts. It is usually a saving of time for each employe to have work for him planned ahead so that he may turn directly from one job number to the next by stamping or "ringing" out on the first job card and ringing in on the next, that there may be no pauses or lost time between the two jobs; this is essential not only from an accounting standpoint but an increase in the individual efficiency. As the cards receive the final stamp or act of recording they should be dropped into a locked box near the time recorder, from where they can be removed each day by a cost department clerk.

There are very many forms of time reports in use, ranging from exceptionally good to exceptionally poor in character and scope. In some machine shops the practice exists to have the time-keepers constantly circulating among the employes and recording each change of jobs. In this plan a special time clerk is, of course, an essential feature. The workmen are required to remember the time they finished one job and started another that they may report to the time-keeper and in nine cases out of ten they make pencil memoranda of such time and the act of such memoranda may just as well have been final as preliminary. It is not profitable to attempt to make bookkeepers out of shop-hands and if the class of help employed in a given shop are illiterate, then with the use of modern accounting devices the shop-hands can in a way act as automatons and accomplish the desired results. In some shops the foreman is directly responsible for the time and himself makes out the time reports as the employes report them; and yet in some the foreman or his clerk makes out the body of the time card leaving the time to be filled in by the workman; this latter way is probably the best under ordinary conditions, especially where time recorders are used and the employes will not have to use any brain capacity in the handling of the time cards. The time recorders give a clear undisputable record and when there are enough registers supplied so that the men need not travel very many feet to record their time it takes them considerably less time than the average shop hand requires to more or less laboriously write the figures in pencil. When the time register is used an "in and out" record is superfluous inasmuch as the regular time reports on a job can be used in compiling the pay rolls. A given employe may work an entire week on a single shop order or again he may work on seven or eight different shop orders in the same day. In the former he may work on seven or eight different shop orders in the same day. In the former case he has but one time report for the day and in the latter he has possibly eight different reports. In almost all cases it is advisable to work out costs on individual parts instead of taking the machine as a whole; in fact the cost in its truer sense is not known unless such costs are known on individual parts. Where costs are worked on individual parts and the parts are being made contemporaneously then the factory order number can apply to the entire machine and the various parts can be made under separate job numbers; using also the factory order number in connection therewith. This plan insures the collation of all cards under the common number and yet gives details of work on the parts in such manner as to have the information effectively classified. A common plan in vogue is to have a list of different operations printed on the back of the time card that the persons making out the cards may indicate an operation by a mark and thus be saved the necessity of writing it out; incidentally in the catagory of printed details is a clock dial printed on the time card in sufficiently large size so that the workman can indicate by a mark thereon his starting time and his stopping time; this is a fairly good plan where clocks are not employed. Another very good idea in cases where recorders are not used is to handle space for "on" divided up into the different classes as for instance: Begun, Continued, Resumed, and also "off" divided


Employee No. 177 Order No. 6273 Job No. 18
Operation Cleaning Crank Shaft
Begun · Continued · Resumed
(See time on last Coupon used.)
Interrupted · Operation Finished
Unfinished · Job Finished.
Time 7:50 Cause of delay
Awaiting new work · Power shut down
Repairing Machine · Cleaning Machine
TIME 2.40 COST 0.47
Employee No. 177 Order No. 6204 Job No. 67
Operation Drilling bed plate
Begun · Continued · Resumed
(See time on last Coupon used.)
Interrupted · Operation Finished
Unfinished · Job Finished
Time Cause of delay
Awaiting new work · Power shut down
Repairing Machine · Cleaning Machine
TIME 2:35 COST .44
Employee No. 127 Order No. 6219 Job No. 127
Operation Cutting gears
Begun · Continued · Resumed
(See time on last Coupon used.)
Interrupted · Operation Finished
Unfinished · Job Finished
Time 7:15 A.M. Cause of delay
Awaiting new work · Power shut down
Repairing Machine · Cleaning Machine
TIME 4:05 COST .71
No. 127 Name J. Anderson
Occupation Machinist
Commenced for Day.
Awaiting New Work 10
Power Shut Down
Repairing Machine
Cleaning Machine 15
Productive 9 20
Total Hours 9 45
Rate per Hour 17½
Total Credit $1 70
Employee will stamp this portion of ticket at such time as pay is to start from, and will stamp the finishing time of first productive job on the first coupon. If productive work is not immediately taken up, or if there is any non-productive work done between regular job numbers, employee will indicate on the coupon what the starting time is and the reason for delay

ONE TIME CARD SCHEME.

[1]Fifth of a series of articles on cost keeping.
[2]Certified public accountant, Cincinnati.

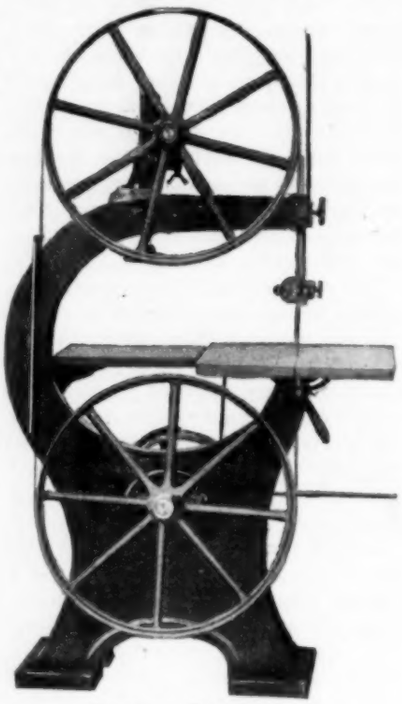
up with different spaces for Interrupted, Unfinished, Operation Finished, Job Finished. This plan can also be used with recorders if the sheet or card be sufficiently large to provide stamping space for all the different classes or again if but one stamping space under each heading be provided, but also in addition a printed list of the different designations which latter might be checked with a pencil or other means of indication as shown.

Some few factories use the decimal system of time reporting wherein the clock dial is divided into tenths making ten periods of six minutes each: 6 minutes being marked 1, 12 marked 2; 18, 3; 24, 4; 30, 5; 36, 6; 42, 7; 48, 8 and 54, marked 9. These markings are for the minute hand only and the hours remain unchanged on the dial; by this plan time is kept within six minutes periods and the "give and take" plan is followed, that is to say in reporting time if the actual time be eight minutes after the hour the minute will be treated as 1, whereas if the actual time be 10 minutes after the hour the minutes will be treated as 2. There are on the market time stamps equipped with the decimal system of minutes so that this plan can be worked either with the stamp or with the ordinary clock with a decimalized dial. At best however, this plan is more or less confusing at times and with the advent of a new and novel invention in the way of calculating devices the decimal clock system will likely sink into disuse as the new mechanism becomes widely known. This new machine is for using in connection with time reports exclusively; the modus operandi is to set an indicator at the starting time as shown by the time report, set a second indicator at the finishing time, then pull a lever similar to that of an adding machine and the hours and minutes of the elapsed time together with the money value at whatever rate per hour is desired will be printed on the time report and simultaneously it will be listed upon a summary and when a total of such summary is desired a lever is pulled and the total is printed both of hours and minutes and money value. The machine will come to be a positive necessity wherever a scientific cost system is maintained as it cuts out so much clerical labor in arriving at results. The total number of hours is a prime necessity in connection with the spreading of manufacturing expense which is to be treated specifically in another chapter and also the total of each day's labor reports is necessary for an entry on the general exhibit, charging "Goods in Process Labor," the controlling accounts and "Manufacturing costs" and crediting "Accruing Pay Roll." Incidentally as the pay roll is made up from the time reports the pay roll should exactly equal the "Accruing Pay Roll CR" account; thus balancing such controlling account each pay roll period. For the purpose of using these time reports in the computation of the pay roll the ideal time report (See figure 1) is the coupon plan by means of which each separate shop order can get its proper charge and the coupons for a given number can be filed under such number and subject to ready reference also the stub containing the totals can be filed under the workmen's number in a temporary file and held there until the pay roll is made up at which time all the cards therein can be removed and summarized for the pay roll. The form of pay roll advocated for this purpose is a master sheet bearing the names and numbers of the employe also columns for perhaps two or three pay periods then slip sheets with the same columns as on the master sheet, save only for name, rate, etc. By this plan the names need not be rewritten until the changes of employes make the time seem ripe. For the distribution of the ordinary portion of the pay roll six columns will be essential although in smaller shops or under certain conditions, three will answer especially if there are not many delays in the shop. The first column to be the total credit to the employe; the second a column headed "Awaiting new work;" the third, "Power shut down;" fourth, "Repairing machine," fifth, "Cleaning machine," sixth, "Productive work." Where the analysis is made every day from the time tickets the non-productive work can all be lumped in one column and thereby make necessary three columns only. In cases where frequent deductions are made from employes pay, special columns will of course be necessary on the pay roll to fit individual cases.

In non-productive work there ought always to be a standing shop order for the different classes of work; as for instance, "Repairing machinery," "Cleaning machinery," "Trucking," "Store room labor," "Sweeping and cleaning shop," etc., etc. For non-productive labor the time report is practically the same as the productive except for a designating color and incidentally the color scheme can apply to advantage as between different departments. Non-productive time reports will not be used ordinarily by producers unless they be the entire day on non-productive work.

NEW BAND SAW OF CRESCENT MACHINE CO.

The Crescent Machine Co., Leetonia, Ohio, builder of band saws, is about to enter the new factory buildings just completed for it, where the line of machines which it builds, and for which there has been an increased demand of late, can be handled to much better advantage. In the accompanying illustration is shown its 32-inch band saw, which has recently been remodeled and improved. The frame is cast in one piece, being of a cored pattern, and an attempt has been made to so distribute the metal as to provide a maximum rigidity. This quality is enhanced by the broad floor base of the machine, which has the ordinary box foot design. The table is capable of being tilted to an angle of 45 degrees by a very simple mechanism operated by a hand lever, so that the table can be rigidly held at any point. The table segments slide in machined ways, so that there is no lateral motion during adjustment. The saw blade also is provided with an adjustable guiding device, so that it may be operated in any desired path on the face of the wheels, the adjustment being possible while the machine is in motion.

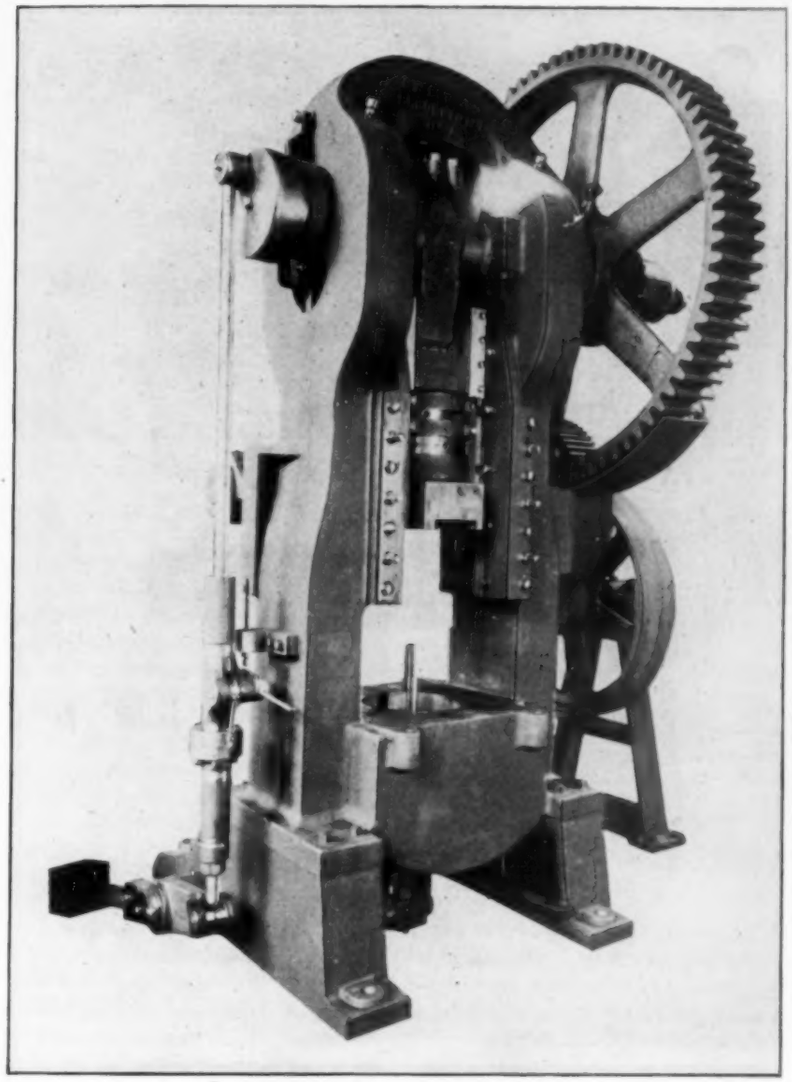


CRESCENT BAND SAW.

Besides this particular type of saw, the company manufactures a variety of machines suitable for all classes of scroll work, five sizes of band saws, with tilting tables, as well as an angle band saw, in the design of all of which devices features are employed which are the result of a careful study.

A LARGE BLISS PRESS.

The constant increase in the variety of articles that are being manufactured in power presses has brought about the development of many presses which, but a few years ago, it would have been considered almost impossible to produce, so massive are all of the parts entering into their construction. Large double crank presses and drawing presses are now becoming quite common but one less frequently comes across a single crank press of the size illustrated, combined with the simplicity of design, ease of manipulation and the great accuracy with which the slide is guided in exceptionally long, adjustable guides.



LARGE BLISS PRESS.

An idea of the size of this press may be had from the following facts:

The frame of this press just built by the E. W. Bliss Co., Brooklyn, N. Y., is a solid casting and weighs over 18,500 pounds and the area of the bed is 31 x 32 inches. The distance from the bed to the slide with the stroke and adjustment up, is 30 inches. The shaft is 9 inches in diameter and has a 12-inch stroke. The proportion of gearing is 25 to 1, the entire train of gears is made from steel castings and the teeth are cut from the solid. The large gear is 80 inches in diameter by 10 inches face and weighs 4,500 pounds. The arrangement of the gearing is not clearly shown in the front view of the press but it is very compact and is so laid out that it will not interfere with an operator standing at the back of the press. The flywheel is 50 inches diameter by 10 inches face and weighs 2,500 pounds. It makes 250 revolutions per minute. The total height of the press is 153 inches and the total weight is something over 41,000 pounds.

Aside from the magnitude of this press, it is interesting in the details of its construction. The pitman is very heavy and is solid with a scraped fit in the slide, the pressure strain being against solid metal. An adjustment of 3 inches is effected by an 8½ inch screw in the slide. This screw is made with a flat thread on the pressure side which prevents all side strains. The knockout which is clearly shown in the illustration, is made to suit any height of die by adjusting the set screw shown on a bracket on the left hand upright. This knockout can also be adjusted by the crank disk which is held to the shaft by a ratchet disk. The working of the press is controlled by a patent automatic jaw clutch which is absolutely positive in its action and which will not click when thrown out. Depressing the foot treadle will cause the slide to make one complete stroke and then stop at the top center.

Norton Grinding Co. Extensions.—The Norton Grinding Co., Worcester, Mass., is planning to build a second shop 85 x 278 feet, with gallery on one side. This shop will be used at first largely as an erecting shop, and will be equipped with two cranes, one of ten tons capacity, and one of five tons. The company have already ordered the equipment for delivery in the early spring, which it expects will enable it to increase its output about 60 per cent above present production. When the new building is complete, the plant will consist of two parallel shops, each 278 feet long. These shops front on New Bond street, and are 72 feet apart. The office building is 40 x 72 feet, and also fronts on New Bond street and is located directly between the two buildings, so that there is communication between the two shops through passages in the office building. The present shop, being relieved of the room formerly occupied by offices and storeroom, and also not accommodating the erecting, will have room for most of the new equipment. A car running on a track connecting the two shops will take the material for the machines from the machine shop to the erecting room. Both shops have in the rear spur tracks of the Boston & Maine railroad. It is expected that the new building will be completed April 1.

The Berwick, Pa., works of the American Car & Foundry Co. is working on an order for 250 cars for the Huntingdon & Broad Top Railroad Co. The Broad Top plans to have all steel cars as soon as they can be built.

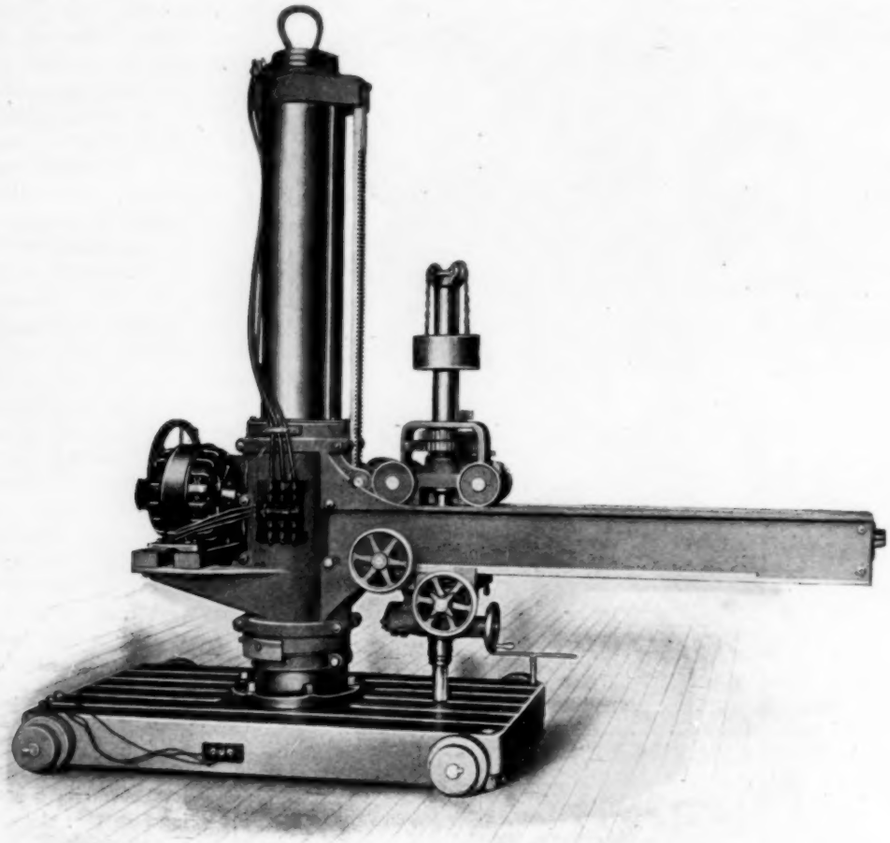
A PORTABLE RADIAL REAMER.

The Hanna Engineering Works, Chicago, is building a direct-connected, electric-driven portable reaming machine intended to meet the necessity for reaming rivet holes after the assembling of material where the weight of the work such as bridge and structural girders makes a portable tool desirable. The machine is built to drive high speed as well as carbon drills to the limit of their requirements at correct and positive feeds.

A 7½-horsepower motor is mounted on an extension on the rear side of the tool and is geared directly to the spindle through a speed changing gear box which provides eight changes of speeds, permitting the use of drills from ¾ of an inch to 4½ inches in diameter. The feed range of this tool is from 0.35 of an inch to 17 inches when the tool is speeded for a 60-foot cutting speed per minute. Torsional strains have been avoided as far as possible by having the central line of the spindle and all supporting members in one vertical plane.

The spindle has a feed travel of 18 inches, and a horizontal movement on the rail of from 20 inches from the center of the column to 7 feet 8 inches at the end of the rail, and the vertical range of travel is from the floor to a height of 6 feet 3 inches above the top of the base. The drilling head is mounted on wheels, and is equipped with a rack and pinion, so that it may be moved on the rail by means of a hand drill. To give stability to the machine, the base is made of such weight and size that with the rail in its highest position and the head at the outer end of the rail, no bolting to the floor or foundation is necessary. The base may be leveled by means of screws at each corner, which adjustment also takes the weight of the tool off of the wheels when it is in operation.

The column is bolted rigidly to the base, and the rail is mounted on it with roller bearings, so that the swinging of the rail requires minimum effort. The rail is raised or lowered on the column by reversing the motor, which acts through the medium of a slip gear clutch. The weight of the tool is, approximately, 10,500 pounds.



PORTABLE RADIAL REAMER

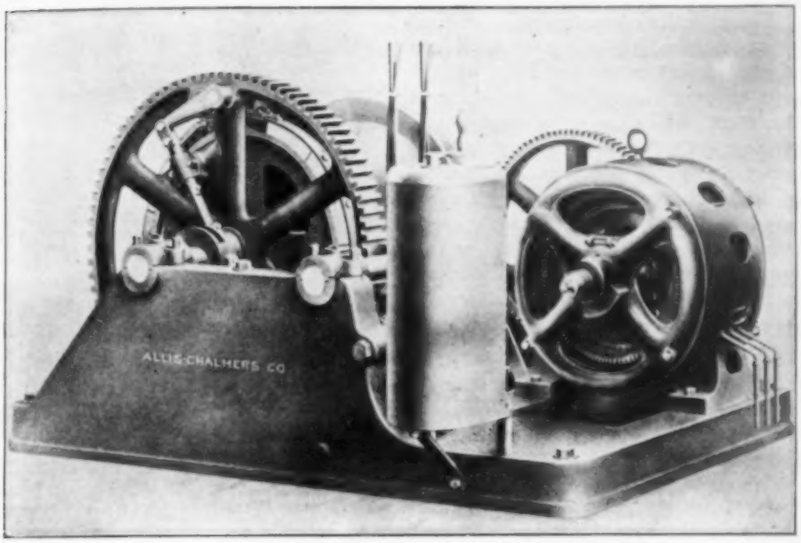
MINING NOTES.

The St. Paul mine is an underground property belonging to Corrigan-McKinney & Co., which has just begun to ship this year. The mine gives promise of developing into a large and valuable property. At the Mesabi Chief, there is an old shaft, which was sunk a number of years ago, but nothing has been done there since that time. Adjoining the Mesabi Chief, on the southeast of the southwest of section 23, township 57, range 22, is a deposit owned and controlled by the Central Iron & Steel Co., which they intend opening up and operating. The Forest was mined by Capt. M. L. Fay, and was worked out about the middle of the summer. Capt. Fay also undertook the mining of the Alexander mine under contract, the operating interest being M. A. Hanna & Co., and it is noteworthy that the royalty paid on this property is one of the highest on the range, being in the neighborhood of 75 cents. There are about 300,000 or 400,000 tons of ore in the Alexander, which is slightly more than was in the Forest. It is presumed that with the giving up of his active interest in the Tesora Mining Co., whose property, including the Tesora mine in Virginia, and the new deposit near Biwabik was recently transferred to the New York State Steel Co. Capt. Fay will also retire from the operation of the Alexander.

ELECTRIC HOISTS FOR MINING.

Electric hoists, in order to give the best service, must be designed and built especially to meet operating conditions. When so constructed and properly installed they are as easily handled and give as good results as steam-driven machines; while they are as readily controlled, are as little liable to get out of order, and require no more skillful operators. They should be heavily and substantially built, conveniently and compactly arranged, and the motor adapted to its work. In many cases the advantages of electric over steam or air-driven hoists are so manifest that argument is unnecessary. For underground locations, or for places at some distance from the necessary location of the power plant, it is much easier and cheaper to run wires than pipes, thus avoiding all loss from condensation or leaks. Long cable runs may also often be avoided economically by the installation of another hoist where an additional power plant is not required. Either direct or alternating current at any of the standard voltages and frequencies may be used, and the hoists can be built for any desired load and speed of rope. Where current is to be taken from an existing plant, its nature is, of course, fixed, and the motors must conform thereto. When a new generating plant is to be installed, however, the question as to whether it is better to use direct or alternating current will depend for its answer largely upon local conditions. The decision should be made only after full consideration by some competent electrical engineer.

The Allis-Chalmers Co., of Milaukee, has recently put upon the market a line of standard machines designed to work under approximately the same conditions as its well-known small steam-driven hoist. The single drum electric hoists are of 15, 25, 35, 50 and 75 horsepower capacity, and double drum hoists are made in 30, 50, 75, 100, 125 and 150 horsepower sizes. The rope speeds and load capacities will be found to meet average requirements, and especial attention has been given to insuring reliable, economical and satisfactory operation. The arrangement of the motor and hoist is shown in the accompanying cut. The usual design and construction obtain in the hoist with modifications to suit the motor.

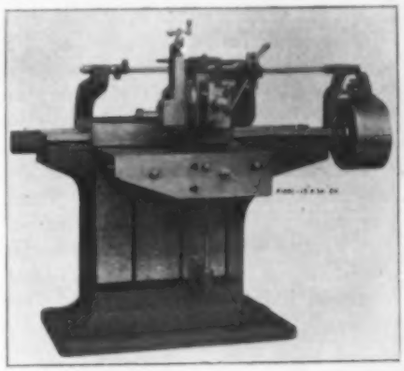


An Electrically Driven Mine Hoist.

Estimates of the amount of steel rails that will be needed during the coming year, by the Hocking Valley, Ohio Central, Kanawha and Michigan and Zanesville and Western railways have been completed and the orders will be placed in a few days. For delivery during 1907, the Hocking Valley will order 5,000 tons of 90-pound rails, the Ohio Central, 4,000 tons of 80-pound rails; the Kanawha and Michigan 4,000 tons of 90 pound and the Zanesville & Western, 500 tons of 70-pound rails. The Ohio Central still has 2,000 tons coming on this year's program and the Hocking Valley has over 1,000 yet to come to complete the 1906 order. The Kanawha and Michigan and Zanesville & Western also have small amounts to receive on this year's order.

OPEN SIDE SHAPER OR PLANER.

The Cincinnati Shaper Co., Cincinnati, Ohio, is presenting the tool illustrated in the accompanying cut for handling to better advantage such classes of work as the pillar or traverse shapers or planers can not so well turn out. The machine illustrated represents the smallest size of this open side shaper, and will make a cut 15 inches wide and 30 inches long. The machine is driven by a single screw and bronze nut, and without the medium of gears. The saddle has a long and wide bearing on the column, and a narrow and deep guiding surface to prevent binding, particularly when the tool is at the outer end of the rail. The saddle is also provided with a tapering gib, adjustable by means of screws at each end, so that uniform contact is afforded on both sides of the gib. The machine is equipped with a positive adjustable cross feed, for either power or hand feeding. The down feed is by hand. The reversing mechanism is of special design, and depends on the turning of the shifting rod both for reversing of the motion of the saddle and for the automatic cross feed to the head, the rod being automatically turned by cams on the saddle coming in contact with the adjustable dogs on the rod. Both the shifting rod, and the elevating screw for the table are fitted with ball bearings, and the cross rail and head are equipped with taper gibs. The head has a down feed of 6½ inches, swivels, is graduated and has a micrometer collar reading to 0.001 inches.



Open Side Planer.

The table is raised and lowered by means of a crank handle, and the supplementary table may be removed to permit of a piece being bolted directly to the table proper. All flat bearings are hand scraped to surface plates, and tee slots are cut from the solid. The machine is capable of handling the keyseating of shafting of any diameter, and its weight with countershaft is 3,450 pounds.

MANUFACTURING COST.[1]

By R. H. Probert, M. E.

The question of ascertaining the cost of production is daily receiving more and more attention from the manufacturers of various lines and the absolute importance of having at least an approximate idea of what their goods cost them to produce is becoming more and more apparent. At first glance, it would seem an easy matter to secure this data, but only those who have tried to ascertain costs in a factory of moderate or large size can fully appreciate the endless difficulties to be overcome. Many systems which work out beautifully on paper are found to be either entirely impracticable or at least subject to great modification when put into actual use. The manufacturer who starts to install a cost system, even a simple one, usually finds that he has the spirited opposition of his foremen and operatives, and this is no small thing to overcome.

In making such an installation, the first things to be considered are: (1) How close an approximation is necessary. (2) What the expense will be in clerical work, etc., to obtain it. That absolute costs can be ascertained is undoubtedly a fact, but the expense involved in obtaining such accurate information is liable to be greater than the information is worth. We are all in the business to make money, and expenditure without return is, of course, unwise, and may not improve the appearance of our balance sheet at the end of the year. In many factories where obtaining an absolute cost would involve a heavy expenditure for clerks, etc., a close approximation which may be equally valuable can be obtained for much less money. The problem is to secure results which are sufficiently accurate for all practical purposes at a minimum expenditure. In using the words "close approximation," please do not infer that I mean guess work. Intelligent estimates based upon actual experience and factory conditions will work out with surprising accuracy.

There are six chief elements entering into the cost of manufacture. (1) productive labor, (2) non-productive labor, (3) raw material, (4) waste or scrap, (5) supply and repair to producing departments, (6) fixed or overhead expense. The above chief elements and their subdivisions cover every expense that can possibly accrue to the cost of manufacture.

In a short paper, it is impossible to go into minute details, but I will take up the six chief elements one by one, touching upon such points as I consider of most importance.

Productive Labor.

Theoretically ascertaining the cost of productive labor accurately is one of the easiest problems dealt with in cost keeping. Practically it is one of the most difficult. In a factory employing only five or ten men working under a capable foreman, the amount of labor chargeable to a certain finished product can be easily ascertained, but multiply the five or ten producers into 500 or 1,000, working in various departments and under foremen of varying capacity, and the task of keeping accurate records of the producing labor becomes one of magnitude. There are various mechanical aids to assist us in this work, time clocks and recorders of several kinds. All of these have their use and help towards accuracy. but all the time clocks in the world will not keep track of the time of the producers unless we have the hearty and intelligent co-operation of our superintendents, foremen and time keepers.

Conditions vary so much in different factories that it is impossible to offer any definite directions as to the methods to be pursued in ascertaining the cost of productive labor. Where the character of the product will permit it, job tickets may be issued to advantage, whereon each workman, his time keeper or foreman enters on a card or slip the amount of time devoted to each particular job, these cards or slips being turned in daily to the cost department and the proper charges made by it on appropriate forms. Such methods would be entirely out of the question for a factory having a continuous production, and other methods would have to be devised.

I believe that a thorough knowledge of the details of the particular branch of manufacture is absolutely necessary to intelligently install a system for the accurate keeping track of productive labor. The manufacturing conditons, the character of the work and the personnel of the operatives, must all be taken into consideration.

For instance, what would work out perfectly in a factory where the operatives were skilled, intelligent, English speaking men, would fail signally in a factory where the operatives were uneducated foreigners. Whatever be your system, let the results be as accurate as possible, for upon the accuracy of your records of the cost of productive labor, hinges the accuracy of your entire cash system.

Non-Productive Labor.

Under this head should be charged all factory employes who are not actual producers. Excepting the superintendent and other factory employes, such as the stock keeper, night watchman, gatekeeper, etc., the non-producers can usually be charged direct to department costs, and it should always be borne in mind that a direct charge should always be made if possible in preference to a pro-rata charge. This rule will greatly increase the accuracy of your costs.

Raw Material.

All material entering into the construction of the product we sell should be classed as raw material, even though it reaches us in a partly or wholly finished state. For instance, if one of us is a machine builder, and another a bolt manufacturer, the finished product of the latter would be the raw material of the former. Keeping an accurate account of the raw material entering into our product is a comparatively simple matter, but, in the case of productive labor, a system that would be perfect for one factory, would not work out in another.

An ideal method where the character of the material used will permit, is to have all material received by a stock keeper and disbursed by him upon department or job requisitions. He keeps also an accurate record in a suitable ruled stock book and makes periodical reports to the cost department. In a continuously producing plant, it is frequently possible to keep an accurate stock of raw material in the general offices, the clerk keeping the stock book never even seeing the raw material itself.

Waste or Scrap.

If a complete stock room system is in operation, the cost of this item may be ascertained through the stock records. In some factories, a simple system of scrap reports may be installed which will answer the purpose. In any event, the keeping track of scrap and waste is worth the very serious consideration of the manufacturer, not only from the cost standpoint, but also with a view of reducing the scrappage. Many a factory could show a satisfactory balance sheet at the end of the year if the management would consider the question of scrap of more importance. It is said that when Armour & Co. get through with a hog, every part of him has been turned into money. The Standard Oil Co. are

[1]Abstract of paper read before the Ohio Society of Mechanical, Electrical and Steam Engineers at the Akron meeting, Nov. 17, 1906.

not very far behind in the absolute utilization of petroleum products.

Raw Material Costs Money.

Work on it costs more money, and if it fails to reach the market as a part of our finished product, there is a dead and sometimes entirely unnecessary loss. Look at your scrap pile, gentlemen, and look closely. See who is responsible for it. Build up a system of comparative records and you will be surprised at the results.

Supply and Repair to Producing Departments.

Under this heading should be charged all supply and repair items which can be charged direct to the various departments. Perishable tools, waste oils, incandescent globes, machine cutters, etc. This account is kept separate from the general supply and repair account for the reasons before mentioned, that a direct charge to a department is a more accurate than any pro-rata charge can be.

Fixed or Overhead Expense.

I have placed this last in my list of chief cost elements, but it is far from being least. This is the cost item which is subject to more guess work on the part of otherwise intelligent manufacturers than all the other elements put together.

Broadly, the fixed or overhead expense account should be charged with every item of expense which cannot be charged direct to a producing department. Such a list might include some items which the manufacturer is in position to charge direct to a department, and other items may have been omitted which are a part of the general fixed expense of other manufacturers. Again, I say "Charge direct" if you can, but remember that all expense items must appear either as a direct or pro-rata charge.

How to Ascertain Our Cost.

Having arrived at the cost of the six elements above mentioned how shall we ascertain the cost of our finished product? It is obvious that the adding together of items 1, 3, 4 and 5, with either a direct or pro-rated charge of item 2 (non productive labor) will give us a part of our cost. Item 6 is, however, yet to be considered. How shall we take care of our fixed or overhead expense, and how shall we carry a proper proportion of it into our cost figures.

You would be surprised at the small importance many manufacturers attach to their fixed expenses as related to their cost estimates. It is far from uncommon for them to make simply a guess and let it go at that. One man who has guessed tells a friend that his fixed expenses amounts to 20 per cent. His friend has been so busy that he has not had time to even guess, so he takes his friend's guess as authority and considering that he runs his own business as cheaply as the other fellow, forever afterwards, his fixed expense is 20 per cent. He may strike a period of low prices on his product, and wonder why his balance sheet at the end of the year shows a loss instead of a gain, as the product was certainly sold at a profit over his "cost."

If you should suggest to him that his added percentage for fixed expenses should be 120 per cent instead of 20 per cent, he would probably say you had paresis. Even should the percentage arrived at be more than a guess, the method of arriving at it may be wrong. While opinions differ largely as to the correct method of figuring the proper proportion of fixed expense to be added to the cost, it is generally agreed that the fixed expenses should be figured against the cost element which fluctuates the least and this is productive labor.

As stated earlier in this paper, the producer is practically the sole money maker for the manufacturer. This being the case, let us use him as a basis for pro-rating our fixed expense. A simple illustration will show why this method is preferable.

Suppose we have a labor cost of $5.00
A material cost of..... 5.00

Total $10.00

We find our percentage of fixed expense figured against cost of material and labor to be 25 per cent. We therefore add 25 per cent to our $10.00 making our cost $12.50. Now suppose we substitute for our material charge $50.00 instead of $5.00, our labor charge remaining the same, then our material and labor will be.....$55.00
and our fixed expense.....13.75

making a cost of 68.75

The labor charge is the same in both instances, but in the one case we have added $2.50 for fixed expenses, and in the other $13.75.

Had we taken our productive labor as a basis, while our percentage would have been larger, the amount we figured it upon would have been smaller, and the addition would have been the same in each instance. Our formula for our cost figures will therefore be as follows:

Add the cost of non-productive labor, waste or scrap, department supply and repair and any other direct charges, together.

Add to this the raw material, and to this total add the cost of productive labor, plus a percentage to cover fixed or overhead expense for a suitable period against the total cost of productive labor for the same period.

The well known man-hour method of pro-rating the overhead expense also has its advocates and in some instances, it will give more satisfactory results than the percentage method.

Be sure you include all proper items in your overhead expenses and watch the scrap pile for waste and spoilt material also waste material that may have been ordered wrong.

BOOK REVIEW.

Types and Details of Bridge Construction, Part II, Plate Girders, by Frank W. Skinner, member A. S. C. E. New York. McGraw Publishing Co. 410 pages. Illustrated. 6½ x 9½ inches. Cloth. Supplied by THE IRON TRADE REVIEW for $4.00

In reading this book one is struck with the large amount of general information it contains on the subject of plate girders and the concise form in which this information is expressed. In the first chapter, for instance, consisting of four pages, we have a complete general description of the American girder and the materials and shapes of which it is built, together with full information on proportions, riveting, etc. The arrangement and classification of the subject matter are excellent. After eight chapters devoted to general design and serivce including information on erection, slipping, and tests, four more are given to examples of existing bridges classified according to length of span.

Next, details of bearings and splices are taken up, the excellence of the arrangement and classification in this part being particularly noticeable. This is followed by discussions on multiple spans, steel towers and highway and special spans. Chapter XXVII on track elevations will prove of special interest to the many engineers connected with this work of present and rapidly increasing importance. The work concludes with six chapters containing discussions of plate girders by eminent designers.

The book throughout is practically a compilation of data on existing bridges, very little original matter or mathematical computation being introduced. This does not in the least detract from its value. We have already several complete treatises on the mathematical theory and design of plate girders, and a book of this sort, in connection with this particular subject, is perhaps needed now more than one of any other kind. The designer searching for some detail established in practice with which to compare his own ideas, or for some suggestions as to the arrangement and proportion of parts, may refer to it with confidence.

TECHNICAL FOUNDRY EDUCATION.

By H. E. Field.

"Any candid observer of the phenomena of modern society will readily admit that bores must be classed among the enemies of the human race and a little consideration will probably lead him to further admission that no species of that extensive genius of noxious creatures is more objectionable than the educational bore. Convinced as I am of the truth of this great social generalization, it is not without a certain trepidation that I venture to address you on an educational topic."

This quotation from that great authority on education, Huxley, expresses in a terse way my hesitancy in bringing to your attention this subject of education. Recent assertions by prominent foundyrmen confirm my belief that this subject is of vital importance to the foundry industry at the present time. President West, of the American Foundrymen's Association, and President Pilkington, of the British Foundrymen's Association made education a key note in their presidential addresses.

President Hadfield, of the Iron and Steel Institute, in his presidential address says: "There is also need for the education of foundrymen. This side of technical industry has hitherto been relegated far too much to chance. No one wishes to decry the value of experience, but there is no reason why foundry managers and foremen should not occupy a position equal to that of the mechanical engineer. Facilities should be given to foundrymen to study the principles of their craft at technical schools and in other ways they should be led to acquire a sound theoretical training and not merely rudiments of practical knowledge."

The American Foundrymen's Association, the National Foundrymen's Association and the trade journals have given attention to the subject. It is a live topic in which every foundryman should be interested; not with a prospect of immediate results, but with an eye to the future when we should have a corps of trained men graduating from our technical schools equipped to intelligently solve the problems of our foundries.

Let us for a few moments examine the present status of our colleges and technical schools and consider their defects as a basis for future improvement.

The only method by which to determine the efficiency of an industrial plant is by studying its output and so, if we would judge our modern educational institutions, we must consider their graduates. In doing so we are reminded of the words of Herbert Spencer when speaking of the graduate and his education. "In his shop, or his office, in managing his estate or his family, in playing his part as a director of a bank, or a railway, he is very little aided by this knowledge he took so many years to acquire—so little that generally the greater part of it drops out of his memory."

This may appear severe when applied to the conditions of today. There are, however, many indications that this statement is not an exaggeration.

Employers are continually protesting against the non-preparation of graduates for a practical business life. In reply the colleges may point with pride to the achievements of their graduates in the commercial and industrial world. This apparent contradition may be readily explained. The average college turns the graduate adrift possessed with a smattering of languages, history, economics, mathematics and science which his future employer finds an imperfect equipment. Coincident with this potpourri of knowledge, the graduate has acquired an ambition to succeed together with a knowledge of how to think. These two qualities, ambition and an ability to think or reason, account for the success of 90 per cent of the college graduates whose advancement has depended upon their own efforts. Valuable as these two qualities are, it would appear that together with them the student could be given a more practical education to aid him in his future vocation.

This subject was capably considered by Mr. Fred W. Taylor, president of the American Society of Mechanical Engineers, in his recent address given at the dedication of the engineering building of the University of Pennsylvania. The following remarks by Mr. Taylor on education from the standpoint of a successful employer should carry weight and deserve careful study. "Within a few years after graduating the college educated engineer far outstrips in position and salary his average competitor who comes up from the ranks." Mr. Taylor emphasizes, "Within a few years" and calls attention to the fact that as a rule the graduate spends the first few years in a state of discontent and unrest, and does not become of real value to himself or to his employer until he has lived down these feelings. He cites as an example one concern which gives the following preference in employing men for certain positions: First, technical graduate; second, college graduate, but employs no college graduate who has not been out at least two years.

These statements together with hundreds of others which might be brought before you show that while our colleges are doing a good work their output is somewhat defective. I do not for a moment wish to decry the value of higher education. I do wish to consider with you and interest you in its defects with the hope that some remedy may be evolved. The first point which I bring before you concerns the selection of the proper institution and courses to fit one for a future work.

Selection of Schools and Courses.

It is not sufficiently appreciated that an entirely different training is necessary to fit one for a professional life from that required to equip one for an industrial occupation. As Spencer says, "If we enquire what is the real motive for giving a boy a classical education we find it to be simply conformity to public opinion. Men dress their children's minds as they do their bodies, in the prevailing fashion."

Is this not true today? Do not temporary surroundings, sentiment and local conditions frequently exert too great an influence on the course of the young student? Do not you as employers of graduates frequently complain of the inadequacy of education as a training for practical work and then allow your son to be guided by the fact that his class mates are going to this or that college, and so he, drifting with the tide, adds one more for you or some other employer to be disappointed in, while he for himself enters his life occupation with a handicap which might have been avoided had you with your greater experience and wider range of vision exerted your influence towards guiding him to a course which might have aided him in his future work.

The parents are not wholly to blame for the lack of assistance given to students in selecting proper courses for study. The modern trend in education is towards giving the student a freer hand in selecting his studies, in other words, an increasing number of subjects are being made optional. This tendency has its good features, also its bad ones. The student is in a formative period and his ideas are neither established nor crystalized. It is the important time of his life in

[1]Read before the New England Foundrymen's Association December 12.

many ways. His selection of subjects determines to a great extent his success or failure in his future occupation, and yet, momentous as this step is, the final decision is often made by the student with no experience to aid him. Mr. Taylor emphasizes the fact that all decisions of consequence in commercial and manufacturing concerns are made by specially trained men. He rightly contends that trained men should select for the student those branches of learning which would be of most value to him in his chosen vocation.

If you in your foundries were continually turning out a defective product would you be contented with complaining about it? No; you would ascertain the cause and remedy it. It is not sufficient for us to grumble about these defects in the selection of subjects; it is necessary that we assist with advice those who are electing courses of study and urge upon our schools and colleges the necessity of engaging men qualified by practical experience to aid the student in adopting his curriculum.

It is interesting to note that an effort along this line is being made by one of our prominent technical schools. If the student, after a sufficient probation period, does not show an aptitude for the course which he has chosen, he is recommended to some other and thus a good engineer will not be spoiled to make a poor chemist, and vice versa.

Relative Value of Subjects Studied.

The relative value of each subject should be carefully considered in making up a course of study. At present too much of the student's time is often proscribed or elected to subjects which while important consume a portion of his attention greatly in excess of their merit.

The tendency towards specialization is a characteristic, almost a mania, of this generation. This perhaps is to be regretted but it would appear advisable to emphasize those branches which will best fit one for the work which he is to do and give less time to those of less relative importance.

As an example, the memory and capacity for learning are both increased by studying languages, but if these languages are to prove of no real value to the student in years to come, the fact that they cultivate the memory is not of sufficient importance to warrant the employment of the student's time at the expense of some other branch which will be of greater future benefit. The study of science gives to the student an even greater opportunity for cultivating the memory and in addition there accrues an improvement of the reasoning power and a knowledge of cause and effect. Science is built upon fixed laws which can be understood only by exerting the reason.

As previously stated, the chief advantage which the college graduate has over the non-graduate is his ability to think or reason. If this is his leading asset, would it not be wise to cultivate it by awarding greater prominence to those subjects which lead him to think or reason? This phase will be more appreciated as we come to realize that it is not what is learned but how it is learned, or as one writer puts it, "We should not attempt to make mental store houses of the students, but mental factories."

Newton said that his success was not due to the fact that he was smarter than other people but that he thought more. Postalozzi, the famous Swiss educator, observes that "Education as the acquiring of information is one thing; it is quite another to develop the human force of a thoughtfully planned course of training mentally, physically and morally, fitting the student for a complete living." Too much emphasis cannot be placed on this phase of education. The mind of the student should be developed for his future work; it should be trained to think and to originate, not simply to acquire. The engineer is not employed for his knowledge of past achievements but for his creative power.

Value of Industrial Discipline.

Upon examining our product, the graduate, through the eyes of the employer, we find one more glaring fault, viz. a lack of appreciation of the practical and commercial side of business life. This leads to the feeling of discontent and unrest mentioned by Mr. Taylor. Mr. Taylor suggests as a remedy that the student before graduation be obliged to spend one year at a manufacturing plant and there come in contact with his fellow men upon a practical working basis. This would give him a correct understanding of actual industrial conditions. His solution would without doubt be an ideal one. It is, however, infeasible owing to obvious disadvantages both from the standpoint of the educational institution and from the standpoint of the manufacturer. It would appear to be more practicable for the educational institution to change its methods in general and the manufacturing establishments to convert their shops into educational institutions. Would it not be better to surround the student in the educational institution with conditions parallel to those he is to encounter in actual work, embracing discipline as to hours, responsibilities, etc?

The problem of the educational institution is to graduate a student with sufficiently developed practical ideas to enable him to take his place at once as a producing factor in our manufacturing plants. In order to do this the student must be given a practical idea of manufacturing life in general and have impressed upon him the responsibilities of his future work. He should be subject to a discipline which will coincide with that of actual work. The conditions which surround the average college education do not tend toward this end. The requirements of a manufacturing plant are very different from those of the majority of professions, consequently the conditions which surrounds the student in preparation for a manufacturing career must be different from those surrounding students whose future is to be a professional one. I believe that a student deciding upon an industrial career should from that minute apprentice himself, as it were, to that career. He should forego the pleasures of a college life and enter upon his course of study not as a mixture of pleasure and work but as a period of work. The attempt to combine the "college life" of the classical university with the strenuous application necessary in the technical school, has never been a marked success. Our technical schools could become institutions with the regular regime of the industrial establishment. The student should be held to the same discipline as is present in industrial plants. Such schools should be free, thus placing the student under obligation to the school for his education rather than the school under obligation to him for his tuition. After graduation the student will be obliged to hold his position through his own efforts and ability. In such an institution the student should hold his place by the same qualifications. The student will graduate with a comprehension of the value of time and he will have been subject to a discipline which will be of inestimable value.

We began by estimating the value of our colleges by their output, the graduate. We found him superior to the non-graduate but defective in many ways. We have briefly discussed the reason for these defects and found them to be first, a lack of forethought on the part of the student, together with inadequate assistance of the part of the college, in selecting the course of study; second a lack of appreciation of the relative value of different subjects in the development of the student; and third, a lack of suitable discipline and environment to prepare the student for assuming practical work in the most advantageous manner.

I have pointed out the remedies which appear to me to be most efficient. Some of these suggestions may appear extreme. The writer believes that it will take radical changes rather than a gradual development to accomplish the desired results.

Bearing in mind these remarks on general education let us consider the specific subject of foundry education.

Foundry Education.

Foundrymen have for years urged that technical schools give more attention to foundry subjects. These requests, however, have been so indefinite that the schools have been at a loss to know just what was required. Discussions which have arisen in associations and trade papers have been characterized by a confusion of ideas as to what would constitute a suitable school or course in foundry practice. This has been due to the fact that two distinct problems have been confounded. A clear understanding of this fact would make future work along this line more productive. You are interested in foundry education in two definite ways: First, in the education of students who will advance into managers and engineers, and, second, in the education of your molders and apprentices. It is an absurdity to suppose that one and the same course of education will answer for both conditions. The methods adopted to train a student to enter the foundry with an idea of eventually becoming an engineer or manager would not be the most effective for making a molder or an apprentice more proficient at this trade or fitting him for a foreman or superintendent. The material to be developed and the results aimed at are not the same and an entirely different method of instruction will be necessary. This is caused by a situation which it will be impossible to change. The two conditions are not to be created but are already in existence. The apprentice and the molder in the majority of instances have only a common school education. When a boy completes a high school training, he seldom spends the time necessary to learn a trade. If the molder is to be educated, a course of study must be organized which will take these facts into consideration.

I dwell upon this point in order to emphasize that the two problems do exist, one of which concerns the preparation of young men to solve the questions of foundry science and foundry progress; the other relates to the developing of the molder into a better mechanic and a broader man.

I have confined my paper to a discussion of the first of these questions. We look to our technical schools for a solution but find that they do not give the matter the attention which its importance warrants. There is a tendency to place this negligence at the doors of the schools and colleges. The fault lies to some extent with the foundrymen themselves. A concerted demand for courses in foundry practice backed by applications from students would help to bring forth the desired results. Schools are not given to creating demands but rather to fulfilling them. The majority of such institutions are not overburdened with surplus funds so that they are not warranted in erecting buildings and hiring instructors unless there is some indication that there will be a use for them. There is no question in my mind that if a technical school should open a properly equipped foundry course with competent instruction, there would be a response which would more than justify the outlay. This, however, is not after the manner of educational institutions. If we are to look to existing technical institutions for courses in foundry practice, we must convince them of the need of such instruction not merely with words but with applications of students and demands for graduates. It was the great demand for educated electrical engineers which, a few years ago, forced all technical schools to install electrical courses. It will be the demand for foundry engineers that will necessitate such institutions adding foundry training. It lies with our associations to make these demands and to back them with a support that will insure success.

Several technical institutions have already installed small foundries which give the students opportunity to become familiar with the ordinary routine followed in making light castings. The foundry is in charge of a practical molder who explains to the class as much about the mechanical side of molding as is possible in the few hours per week that are given to this branch of work. There is but one advantage to the student, viz., he becomes familiar with the materials used in that special school. An equal amount of information could be acquired in any foundry in a week's time. Such courses do not teach advanced foundry practice, in fact, they only illustrate it in its most antiquated form. Instead of being instructed in the most modern methods of making castings, the student is trained to do by hand what is now done with machines with a great saving of labor. The same fault exists in the teaching of cupola practice. The amount of coke and the proportion of expensive pig iron used would bankrupt a foundry working on a commercial basis. Careful attention is given to perfecting students in the use of hand ladles for pouring castings instead of teaching them the modern methods of handling iron by means of cranes, trolleys, etc. The present proceedure gives the student no idea of economy in time or materials. It makes him impracticable and, to a certain extent, impossible until he has spent a year in getting rid of his antiquated ideas and another year in catching up to the times.

A foundry course to be of value should specialize in foundry practice; it should not merely teach molding from a mechanical standpoint. The reasons for making different castings in special ways should be explained; the occasion for the several methods of gating should be made clear and demonstrations of properly and improperly gated castings shown. Feeding ought to be illustrated by examples showing the effect of different sizes and positions of risers. Castings correctly and incorrectly vented should be made to prove the importance of proper venting. The student ought to be given examples of the most modern methods of making different grades of castings. Machine molding, green sand, dry sand, and loom work should be illustrated and the advantages of each explained. It is more important that the student understand the principles which underlie the practical operation than that he be able to do the work with his hands. The mere ability to ram sand is of no value to the student, the value to him lies in being able to judge by the appearance of the castings whether the sand has been rammed too hard or not hard enough.

A school that turned out finished molders would be a valuable institution. It is not for this purpose, however, that we send students to technical schools. It is to have them taught those things which the practical molder with more limited view cannot see. Mere ramming of sand under an instructor who has, nine cases out of ten, never even had experience as a foreman does not teach them this. They must be taught to think and reason correctly as to cause and effect and then they will prove of value in our foundries.

The student should also study different kinds and grades of foundry materials, such as sands, blacking, binder, etc., analyze them, note their composition and the effects of their use.

They should be taught to analyze the iron, to make up the mixture and to analyze the resultant castings. Different grades of castings should be made and thus give the opportunity to study the characteristic effect of vari-

ous compositions on the physical structure.

Cupola changes should be studied and advanced cupola construction taught. The improved condition existing in the most modern foundries should be brought to the attention of the student by example when possible, and when not by lectures and illustrations.

In addition to these subjects which pertain directly to the foundry, instruction should be given in metallurgy, electricity, mechanics, steam engineering, mathematics, drawing, etc., bearing in mind that time should be devoted to these subjects only in proportion to their relative value to foundrymen. For example, attention need only be given to that part of electrical and mechanical engineering which will prove of practical value to the foundry engineer in supervising the installation and operation of electrical and mechanical appliances in connection with the foundry. This point cannot be too strongly emphasized. I appreciate the value of studying the basic principles of any branch of learning. In a special course the theory and basic principles of the subjects which are most important to that course should be given the preference and only such time devoted to other allied subjects as their relative value or importance warrants.

Together with the above course of study, the student should be surrounded by the discipline discussed in the first part of the paper in order to train him for the duties and responsibilities which he will be obliged to assume in actual work.

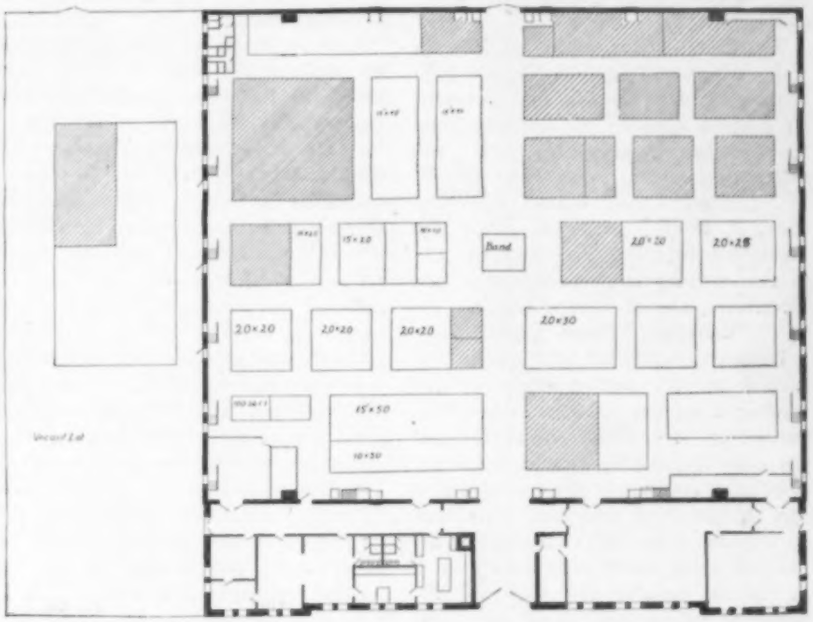
A foundry course conducted upon the above lines, aided by the advice of practical foundrymen, employing for instructors only those who have had successful careers in up-to-date foundries, would turn out a class of young men as graduates who would be capable of at once assuming useful positions in our foundries, and who should in a few years develop into successful managers and engineers.

It is Ruskin who says, "Truth is never learned in any department of industry by arguing but by working and observing." So I would urge upon you as individuals and as an association to take up this matter of education and to work and to observe. We have had the matter before us in one form or another for several years and yet have accomplished but little definite work. It may be we have had too much arguing and too little "working" and "observing."

FOUNDRY SUPPLIES.

Elaborate Preparations for the Display at Philadelphia.

The preparations for the convention of the American Foundrymen's Association to be held in Philadelphia May 20th to 24th next, are progressing very well, and the exhibit of foundry supplies and equipment at the same time in connection therewith by the Foundry Supply Association, is now an assured success. A floor plan of the armory has been prepared, as shown in the accompanying illustration. The armory is a building 165 x 190 feet on the inside with a number of rooms adjacent, one of which will be used for the meetings of the A. F. A. Adjoining the armory at the side there is a vacant lot 100 x 200 feet in which there will be erected a temporary building for such exhibits as could not ordinarily be placed in the armory.



PLAN OF THE SECOND REGIMENT ARMORY, WHERE THE EXHIBIT IS TO BE HELD.

The space already definitely allotted is indicated by the cross-sectioned areas. In addition to that already assigned there are several applications which have been received that have not as yet been granted on account of the fact that the size of the space has not been determined. It is expected that there will be a number of exhibits in the temporary building in the vacant lot adjoining the armory. This will include oil melting furnaces and machines which require special foundations. Arrangements have been made for supplying compressed air for those requiring it. The exhibits already arranged for cover practically the entire line of equipment for foundries, but it is hoped that those who have not as yet joined the association or availed themselves of the opportunities in connection with the exhibit, will make haste to do so while there is still space available.

This convention will undoubtedly be by far the largest gathering of foundry men which has ever been brought together, as it now appears certain that there will be over a thousand present from outside of Philadelphia. The program, as thus far outlined, is better than that presented at any of the previous conventions. The fact that the Brass Foundrymen's Supply Association will be organized during the convention assures the attendance of a very large number of foundrymen interested in brass foundry practice, and one session will be devoted to the brass foundry interests. The foundry foremen will, of course, as usual, be represented and hold special sessions.

H. M. Lane, the secretary of the Foundry Supply Association, has resigned his position as editor of THE FOUNDRY with the intention of devoting his energies to consulting foundry engineering, but the new arrangement will give him ample time to look after all of the necessary preparations for the Philadelphia convention and to make it the greatest success possible.

Applications for membership in the association, or for space in the exhibit, should be sent to H. M. Lane, Sec., Schofield building, Cleveland, O.

ELECTRICAL EQUIPMENT

Being Installed in Large Canadian Works.—Railways Spending Sixty Millions.

(Special Correspondence.)

Toronto, Can., Dec. 31.—The Canadian Westinghouse Co., of Hamilton, is filling some large and important orders for electrical equipment. It has completely equipped the new harvester works of Grost & Wood at Smith's Falls, Ont., replacing the plant destroyed some time ago by fire. The outfit includes one 230 K. W., 440 volts, revolving field engine, one 140 K. W., 440 volts, revolving field engine with generators complete and induction motors aggregating 520 horse power.

The Ontario Power Co., of Niagara Falls, which will have the largest generating plant in Canada, has increased its present capacity by ordering from the Canadian Westinghouse Co. two alternating current generators 7,460 K. W., 3 phase, 12,000 volts, 25 cyles, 187½ R. M. P., with the necessary switchboards. The Westinghouse Co. is also making large additions to the electrical plant of Berlin, Ont.

Canadian Railway Costs.

Estimates based on information furnished by the managements of the leading Canadian railways, give $52,000,000 as the total amount either spent in 1907, or appropriated for expenditure in 1907 in the construction and equipment of new lines of railway in Canada. This is exclusive of the amount being spent in the west by J. J. Hill in pushing the work for the Great Northern and allied lines, and for that spent by small independent roads, probably amounting to $10,000,000. The total mileage under construction this year is estimated at 3,314 miles.

Seek Laborers Abroad.

The Canadian Manufacturers' Association which has for some time complained of the scarcity of skilled labor in many lines, has appointed Louis Leopold, as manager of the labor bureau, which it is establishing in London, Eng. Mr. Leopold is now in Canada familiarizing himself with the situation and the special needs of the manufacturers.

The Dominion Car & Foundry Co., Ltd., has received a Dominion charter of incorporation the capital being $5,000,000. The head office will be in Montreal. The incorporators, Wm. V. Kelly and Robert P. Lamont, Chicago; Wilson W. Butler, Saratoga Springs, N. Y.; George McAvity, St. John, N. B.; Archibald H. Chave and John A. Lamont, Montreal

Bechbels, Ltd., of Waterloo, with $75,000 capital, has been incorporated under the laws of Ontario, to manufacture brick, clay products, tools, machinery, etc. The provisional directors are: Byron E. Bechbel, Wilson B. Bechbel, Chas. H. Bechbel, Wm. J. Watson, Chas. E. Whyard and Phoebe A. Watson.

OBITUARIES.

Ross Watt, president of the Watt Mining Car Wheel Co., Barnesville, O., died Dec. 22, after a short illness.

Theodore Hiertz, founder and president of the Theodore Hiertz Metal Co., St. Louis, died Dec. 17 at the age of 75. He was a native of Vianden, Luxemburg, coming to the United States in 1856.

Edward P. Bullard Sr., president of the Bullard Machine Co., Bridgeport, Conn., died of heart trouble in Braidentown, Fla., Dec. 22, at the age of 65. He is survived by a widow, five sons and two daughters.

Charles S. Borger, president of the Borger Bros. Co., boiler manufacturers of Columbus, O., died Dec. 24, at the age of 28. About a year ago he suffered an attack of paralysis from which he never fully recovered. He was educated at Ohio State university.

James Noxon, who founded the Noxon Bros. Mfg. Co., of Ingersoll, Ont., one of the largest manufacturing industries of Ontario, died suddenly at his home in Toronto, Dec. 16, aged 74 years. He took a very active part in industrial and political affairs for many years, and in 1890 he was appointed inspector of prisons, which he held until last year.

IN EASTERN PENNSYLVANIA.

The works of the Ridgway Machine Tool Co. at Ridgway, Pa., have been taken over by the Niles-Bement-Pond Co., the transfer being made Dec. 29. The stockholders of the Ridgway company will receive shares in the Niles Co. it is understood, and the plant will be considerably enlarged.

The Longmead Iron Co. has started its new puddle mill at Carshocken, Pa. This plant contains ten furnaces and has perhaps the most complete electric system of any plant in the state.

Arrangements have been made to start work on a steel tank shop at the Milton, Pa., plant of the American Car & Foundry Co. The idea is to have material fashioned for steel cars at the plant.

The Duquesne Armature Works has been formed and a Pennsylvania charter asked. The men interested are represented by John McCartney Kennedy, of Pittsburg, who is also one of the incorporators.

NEARING COMPLETION.

Part of the Plant of the New York State Steel Co. Will Soon be in Operation.

The plant of the New York State Steel Co. at Buffalo, is rapidly nearing completion. Work on the blooming mill, soaking pits, power houses, boiler house and producers is finished and they are ready for operation. The open-hearth furnace is not quite complete, but will be in a few weeks' time. It is intended by the management to begin operations in February and by March 1 to turn out finished steel products. When the plant begins work, it will employ between 300 and 500 men and later, when the new enterprise gets well into its work the number of employes will necessarily be greatly increased.

Blast furnace No. 1 is now under construction and the work is progressing well. It will be lighted, if present plans do not miscarry, Jan. 1, 1908. Contracts have just been closed which provide for its completion before that date.

The New York State Steel Co. was organized by a group of successful Buffalo business men. It is capitalized at $2,500,000, nearly half of which has been paid in at par. The following constitutes the board of directors: Spencer Kellogg, president; J. D. Larkin, Spencer Kellogg Jr., S. H. Knox, Arthur G. Yates, Howard Kellogg, Whitney G. Case, Stuart R. Mann, R. R. Hillman. Mr. Hillman is manager.

Steel rails which will be manufactured by this company will be made by the open-hearth process. A 200-ton Talbot open-hearth furnace has already been built, with auxiliary equipment of gas producers, melting cupolas, etc.

It has been determined that the new plant to be built in the Buffalo district by the Seneca Iron & Steel Co., to manufacture sheet steel will be located at Blasdell, N. Y., which is in the town of West Seneca and south of Buffalo. It is a short distance, however, from the Buffalo city line, and the site selected is of easy access to the plants of the Lackawanna Steel Co. and the Buffalo & Susquehanna Iron Co. Six carloads of material to be used in the construction have already arrived at Buffalo.

James Patterson of Youngstown, O., is president of the company. It formerly owned a large sheet mill at Niles, O., and which was sold to the United States Steel Corporation. His brother, Alexander Patterson of Pittsburg, formerly with Zug & Co., of that city, is secretary and treasurer of the new enterprise.

Announcement was made by an officer of the Buffalo Manufacturers' Club this week that a mill for rolling bar iron and the production of railroad spikes would be built in that city this year.

The Financial Conditions of 1906 and 1907.

A striking parallel may be drawn between conditions prevailing in American financial affairs during the year just closed and those surrounding the iron and steel industry. Intimately connected as are the activities of manufacturing and finance, however, this apparent coincidence must finally resolve itself into a similarity of results wrought by common forces operating in much the same manner upon co-operating avenues of business effort.

Iron and steel making in 1906 was in the face of the heaviest consumption in history. Likewise, in the financial world the demand was insistent and of enormous proportions.

To meet the unusual conditions, new furnaces and finishing mills were erected and operated to capacity; yet the output, at that, was inadequate and today there is an approach to famine conditions. The per capita amount of money in circulation was increased steadily during the year, yet it failed to meet the growing demand and it was frequently necessary to adopt remedial measures when credit became strained or interest rates abnormal. This has been productive of a cry for a more elastic currency, the securing of which is one of the vital and perplexing problems now pending.

In iron and steel there has been a constant tendency toward higher prices throughout the year, and importations of both pig iron and billets were resorted to. In the money markets high rates for both time and call loans prevailed during much of the year, and importations of gold were made whenever that method of relief from a practical gold famine was possible.

The parallel, so-called, is capable of further continuance. It has been carried sufficiently far, however, to establish the intimate connection of manufacturing and the money market. Some forecast into the actions of the latter may therefore be based with a degree of accuracy upon what the coming year is certain to have in store for the producer of iron and steel.

With perhaps 90 per cent of the possible make of pig iron during the first quarter and 75 per cent during the second already under contract,—with many consumers still uncovered—and with extremely active buying for the entire last half, wherever furnaces are willing to enter that market, a continuance of present activities in iron making is assured beyond the possibility of interruption by any agencies which can be foreseen. Any price declines, even should they develop early in the year, would have little effect upon first half iron and on only a part of last half. In steel making and the manufacture of finished materials, there are certain lines, notably steel rails and bars, which present bookings alone would keep extremely active for the twelve months. Other lines, though more susceptible to influence by future conditions, are sold well ahead.

Judged from this viewpoint, the money market during 1907 should have much the same conditions to contend with and should be liable to much the same experiences as in the year just closed. Save for the fact that the crop movement is out of the way for the next few months, financial demands are apparently to show little diminution. Much of the new construction work begun in 1906 is yet unfinished and will lay the greater part of its burden on the financial resources of the current year. Record business, too, means that larger credit and more ample currency will be imperative.

The *London Economist* said recently: "The country that will govern the value of money in the spring of next year (1907) will be the United States. The amount of gold that will be taken by that country is in large measure dependent upon whether or not congress passes legislation by which an emergency bank note issue can be created in the autumn months." This forecast from across the Atlantic tells of conditions which sound very much like those of the year just ended.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Dec. 28	Changes In Week	Date 1907 Ann. Meet.	Stock Outstanding	Dividend Basis	Dividend Being Paid	Date Last Div. Pay.
Allis-Chalmers	16¾	− ⅛	Sept. 5	19,820,000			
Allis-Chalmers pr	44¾	+ 1		16,150,000	7 cum		Feb., 1904
American Can	5⅞	.....	Feb. 5	41,233,800			
Am. Can pr	54	.....		41,233,300	7 cum	5 Q.	Jan., 1907
Am. Car and Fdy	42⅞	+ ¼	June 27	30,000,000		½ Q.	Jan., 1907
Am. Car and Fdy pr	101	+ ⅜		30,000,000	7 n. c.	7 Q.	Jan., 1907
American Loc	72⅜	− ⅝	Oct. 5	25,000,000		1¾	Feb., 1907
American Loc. pr	108½	− 2½		24,100,000	7 cum	7 Q.	Jan., 1907
American Ship	75	.....	Oct. 2	7,600,000	6	1 Q.	Dec. 1906
American Ship. pr	109	.....		7,900,000	7 n. c.	1¾ Q.	Jan. 1907
Am. Steel Foundries	11	+1	Oct. 1	15 810,000			
Am. Steel Foundries pr.	45⅞	+ ⅜		17,240,000	6 cum		Aug., 1904
Barney & Smith	70	.....	June 4	2,000,000	4	4	Dec., 1906
Barney & Smith pr	140	+1		2,500,000	8 cum	8 Q.	Dec., 1906
Bethlehem Steel	19	+ ¼	April 2	14 862,000			
Bethlehem Steel pr	60	.....		14,908,000	7 n. c.	3 Q.	Nov., 1906
Cambria Steel	37⅝	− ⅜	Mar. 19	45,000,000*	6	3 Q.	Aug., 1906
Cambria Iron	47½	.....		5,468,000*	4	4 S. A.	Oct., 1906
Chicago Pneumatic Tool	49½	.....	Feb 18	6,145,800	4	4 Q.	Jan., 1907
Colorado Fuel	53½	−2¼	Oct. 21	30,132,000			Apr., 1902
Crucible Steel	11¼	.....	Oct. 16	24,578 400			
Crucible Steel pr	76¾	− ¼		24,436,500	7 cum	6	Dec., 1906
Empire Steel	6	.....	Feb. 27	2,281,400			
Empire Steel pr	50	.....		2,500,000	6 cum	3 S. A.	July, 1906
Fay & Egan	100	+5	Feb. 19	1,000,000	6	6 Q.	Nov., 1906
Fay & Egan pr	128½	.....		1,000,000	7 cum	7 Q.	Nov., 1906
General Electric	159⅞	+1¾	May 14	54,356,000	8	8 Q.	Jan., 1907
Harbison-Walker	13¼	.....	Jan. 21	18,000,000	6		
Harbison-Walker pr	80	.....		9,600,000	6 cum	6 Q.	Jan., 1907
International Pump	38½	− ½	June 4	17,762,500		2	Apr., 1905
International Pump pr	80⅜	− ⅜		11,950,000	6 cum	6 Q.	Nov., 1906
Lackawanna Steel	71	.....	Mar. 13	34,971,400			
Lake Sup. Corp		.....	Oct. 2	40,000,000			
New York Air Brake	137¾	.....	June 18	10,000,000	8	8 Q.	Jan., 1907
Niles-Bement-Pond	130	.....	Feb. 6	5,000,000	6	6 Q.	Sept, 1906
Niles-Bement-Pond pr	105	.....		2,000,000	6 cum	6 Q.	Dec., 1906
Otis Elevator Co	50	.....	March 18	6,350,300		2 A.	Apr., 1906
Otis Elevator Co. pr	96	+1		6,308,500	6 n. c.	6 Q.	Jan., 1907
Penn. Steel		.....	May 13	10,750,000			
Penn. Steel pr	104	.....		16,500,000	7 n. c.	7 S. A.	Nov., 1906
Pittsburg Coal Co	17	+1	Feb. 11	29,045,400			
Pittsburg Coal pr	58¼	+ ¾		30,217,700	7 c		Apr., 1905
Pressed Stl Car	53⅜	+ ⅛	Feb. 20	12,500,000		3	Aug., 1904
Pressed Stl. Car pr	99	− ¼		12,500,000	7 n. c.	7 Q.	Nov., 1906
Pullman	180	−1	Oct. 17	100,000,000	8	8 Q.	Oct., 1906
Railway Stl. Spring	53	+ ⅛	Mar 7	13,500,000		4 S. A.	Oct., 1906
Railway Stl. Spring pr	98½	+ ⅜		13,500,000	7 cum	7 Q.	Dec. 1906
Rep. Iron & Steel	38⅞	+ ⅜	Oct. 9	27,191,000			
Rep. Iron & Steel pr	96¾	+ ⅛		20,416 900	7 cum	7 Q.	Jan., 1907
Sloss-Sheffield	74	−1½	Mar. 5	10,000,000	5	5 S. A.	Oct., 1906
Sloss-Sheffield pr	105	.....		6,700,000	7 n. c.	7 Q.	Jan , 1907
Tenn. Coal & Iron	160	.....	May	22,553,600	4	4 S.	Nov., 1906
U. S. Pipe & Fdy	46½	+1	June 26	12,500,000	4	4 Q.	Dec., 1906
U. S. Pipe & Fdy. pr	85	− ⅝		12,500,000	7 n. c.	7 Q.	Dec., 1906
U. S. Steel	48	− ⅛	April 15	508,302,500	2 n. c	½ Q.	Oct., 1906
U. S. Steel pr	104½	+ ⅝		360,281,100	7 cum	7 Q.	Nov., 1906
U. S. Steel 5's	97⅜	.....		463,798,000	5	5 A.	
Va. Iron, Coal & Coke	79½	− ½	Sept. 17	8,641,000			
Westinghouse Elec	151	.....	June 26	20,986,350*	10	10 Q.	Jan., 1907
West'ghouse Air Brake	157	+1	Oct. 1	11,000 000*		22½ Q.	Jan. 1907

Par value of shares, $100, except those starred, $50.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Schull Steel Castings & Mfg. Co., Canton, O., has been incorporated with a capital of $150,000 by J. H. Kauffman, John Halin, L. E. Schull, Frank J. Bardner, E. J. Van Horn and A. H. Elliott.

The Benoit Transmitting Power Co., Worcester, Mass., has been organized with a capitalization of $100,000 to deal in transmitting power machinery. The incorporators are: E. A. Benoit, Napoleon Oliver and Mark N. Skerrett, all of Worcester.

The National Cash Register Co., Dayton, O., has increased its common stock from $4,000,000 to $9,000,000. Preferred stock to the amount of $1,000,000 is outstanding.

The R. M. Dillon Steam Boiler Works, Fitchburg, Mass., has been incorporated to deal in steam boilers, flues and other goods. The capital stock of the company is $100,000, and the incorporators are: David M. Dillon, F. N. Dillon and D. Frank Dillon, all of Fitchburg.

The Schultz Mfg. Co., Ltd., has been incorporated under the laws of Ontario to manufacture metal goods, castings, etc., with head office at Hamilton. The capital stock of the company is $50,000, and the provisional directors are: Ernest P. Schultz, Alfred H. Brittain and Albert Schultz.

The Jenney Safety Switch Co., Westfield, Mass., has been incorporated to deal in railway switches and mechanical devices. The capital stock of the company is $100,000, and the incorporators are: Walter R. Jenney, Charles H. Beals and A. F. Toomey, all of the above address.

The Litchfield Engine Co., Litchfield, Ill., has been organized with a capitalization of $100,000 by Edward Sweeney, G. A. Sihler and William Wiegriffe.

The Menzel & Jeffrey Co., Minneapolis, has been formed to carry on the foundry business of Menzel & Jeffrey. The authorized capital stock of the company is $100,000, and the incorporators are: Charles G. Menzel, J. Arthur Jeffrey, Thomas Mulcahy and R. J. Smith.

The National Coal & Coke Co., Bates, Ark., has been organized with a capitalization of $300,000 by C. Remington, M. B. Davidson, of Bates; J. G. Wamack, M. R. Lively and P. E. Ford, of Webb City, Mo. The new company proposes to open and operate a coal mine near Bates.

The Woodstock Iron & Steel Corporation, capital $1,500,000, has been chartered at Norfolk, Va., for the purpose of operating blast furnaces at Birmingham and Anniston, Ala., and for mining ore and manufacturing coke in Alabama and Georgia. The corporation is headed by J. M. Barr, of Norfolk, Va., who is both president and treasurer; J. B. Carrington, of Birmingham, vice president, and A. W. Wagner, of Norfolk, secretary. The directors include Ernest Williams, of Lynchburg, Va., W. R. Bonsall, of Hamlet, N. C.; W. H. McQuail, of Pottsville, Pa., and B. T. Dulaney, of Bristol, Tenn. The furnaces at Anniston can be put in condition for operation on short notice. Other properties acquired by the new company will be operated on an extensive scale.

The Reading Chain Block Co. has been incorporated to manufacture chain blocks and pulleys, etc. The capital stock is $25,000, and the incorporators are: F. H. Howard and Mabel L. Howard, Reading, Pa.; Henry K. Pomeroy, 1183 East Fortieth street, New York.

The Brown Clutch Co., Elyria, O., has been organized with a capital of $100,000. A factory to employ fifty men will be built.

The Stevenson Machine Co., Buffalo, has been incorporated with a capital of $100,000 by C. P. Stevenson, L. G. Kelley and A. Baker. The new company will manufacture a newly patented routing machine for woodworking purposes and special tools. It is reported that factory premises have been secured.

The Du Bois Iron Works, Du Bois, Pa., capitalized at $1,000,000, will manufacture gas and gasoline engines under the patents and designs of Arthur A. Lazier. This concern has taken over the entire business of the Lazier Engine & Mfg. Co., of Buffalo.

The W. G. King Co., Buffalo, has been organized with a capitalization of $100,000, and has leased factory space which it will equip at once. The new company will manufacture machinery, special machine tools and mechanical devices.

The Wetherill Finished Castings Co., Philadelphia, has been organized by S. P. Wetherill, J. P. Wetherill and S. P. Wetherill Jr., to manufacture various kinds of castings under processes controlled by the owners.

The Federal Rolling Mill Co., capitalized at $250,000, has been incorporated by Gustave Benjamin, of the Benjamin Iron & Steel Co., Buffalo, who recently took over the Elmira Rolling Mills Co.'s plant at Elmira, N. Y.

New Construction:—

The Ralston Steel Car Co., Columbus, O., now has its extension to the main shop 300 feet long under roof, and will occupy it within a few weeks. In the spring the temporary frame structure, used as a paint shop, will be replaced by a steel building. A steel foundry may be installed in the near future.

The Lebanon Steel Casting Co. states that the foundry which it is to erect at Lebanon, Pa., will be equipped for the manufacture of light crucible steel castings, ranging in weight up to 100 pounds. Present requirements have been filled.

The Etna Steel & Iron Co., Etna, Ga., is constructing washing plants, machine shop, warehouse and employes' dwellings, in connection with its development of iron mines near Etna. A blast furnace may be erected later. The New York office of the company is at 42 Broadway.

The Hartford Machine Screw Co., Hartford, Conn., is to erect a four-story building as an addition to its present plant. Contracts will shortly be let, and work will begin early in the spring. Philip B. Gale is vice president and manager.

The Central Steel Castings Co., Columbus, O., recently incorporated, will place contracts for the erection of its plant about Jan. 20. These will include a foundry and power house of steel construction, a cleaning and shipping department and an office building. The promoters of the company, J. V. L. Bonney and Walter B. Floyd, have returned from an eastern trip on which a number of plants were inspected.

The D. & W. Fuse Co., Providence, R. I., is to erect a one-story structure 40 x 70 feet of brick and steel to be used for foundry purposes.

The Standard Steel Car Co., of Butler, Pa., has been offered a free 50-acre site, located at West Moravia, four miles south of New Castle, Pa., on condition that the proposed extensive plant of that company be located there.

The Alliance Machine Co., Alliance, O., is to increase its capital to $500,000 early in 1907 for the purpose of erecting such structures as will double the output of the plant. In case this is done the company will have a machine

shop and assembling room 123 x 760. President W. H. Purcell has sent out inquiries covering a duplicate building and machinery.

Austin Kelley, of Ashland, Ky., is organizing a company to erect a large blast furnace at that place. It is stated that the greater portion of the $200,000 capital stock has already been subscribed.

The Chambersburg Engineering Co., Chambersburg, Pa., is to issue $200,000 in bonds to pay for improvements now being made at its plant. The new construction work includes a large steel foundry.

The Ohio State Board of Agriculture has awarded the contracts for the construction of the new steel grandstand at the state fair grounds to the following bidders: Excavation and reinforced steel and concrete work to the Concrete & Steel Co., Cincinnati, at $24,962; structural steel work and roofing to the Capitol Construction Co., Columbus, at $12,554; carpenter, slate, tin, galvanized iron and tin work and painting to D. W. McGrath, Columbus, at $2,656. The work is to be completed by July 1. The structure will have a seating capacity of 7,000.

Official of the National Tube Co. states that there is no truth in current press reports that an immense tube mill is to be erected near Elizabeth, Pa.

Extensive operations are about to begin in the vicinity of Pikeville, Ky., where several coal and coke concerns are shortly to construct a large number of beehive coke ovens. Coal lands recently leased from the Big Sandy Co., Boston, Mass., will be developed. The concerns interested include the Edgewater Coal & Coke Co., the Greenough Coal & Coke Co. and the Marrowbone Coal & Coke Co., of Lookout, Ky., and the Pike Coal & Coke Co., of Pikeville.

The Davenport Locomotive Works, Davenport, Ia., builder of light locomotives, has purchased a tract of 27 acres adjoining its plant to provide for future extensions. The immediate plans of the company provide for the erection of a new foundry, 90 x 160 feet, the equipment for which has not yet been purchased.

The Allegheny Steel Co., Pittsburg, is adding a fourth open-hearth furnace to its work at Avenue, Pa.

The Berger Mfg. Co., Canton, O., will erect a new galvanizing department building 75 x 375 feet. The space now occupied by the galvanizing department will be added to the roofing department, the latter having outgrown its present productive capacity. Buildings for additional mills, which this company has had under way, are about completed. The five hot mills and bar mills, with furnaces, will be in operation within a short time.

The Standard Foundry & Steel Co. is taking bids for the construction of a steel and corrugated building to contain the plant which it will erect at Jeannette, Pa.

The American Sheet & Tin Plate Co. is making improvements to its Scottdale works. Two steel buildings, equipped with 15-ton traveling cranes, and containing six galvanizing pots, are being erected for a galvanizing department. A steel hot mill building and a steel annealing building, containing six double annealing furnaces, each to be equipped with a 30-ton electric traveling crane, will be erected.

C. J. Kirk and other New Castle, Pa., capitalists are interested in securing the erection of a large rolling mill at that place.

The Buffalo Brake Beam Co., 130 Pine street, New York, has purchased a five-acre tract of land adjacent to the plant of the Lackawanna Steel Co. in South Buffalo, and, it is reported, that plans are being prepared for the erection of a new plant. The company already has a large plant at Buffalo which will be abandoned upon the completion of the new plant. The machinery now used in the old plant will be removed to the new building, but arrangements are being made by C. J. Bacher, resident manager at Buffalo, for considerable new equipment.

General Industrial Notes:—

The Samuel M. Shimer Co., Cleveland, dealer in pig iron, iron ore and scrap, has moved its headquarters from its yard at Newburg to 36-37 Commercial Bank building, Superior and Bank streets, the change being made Jan. 1.

The Mesta Machine Co., West Homestead, Pa., following its usual custom was host at a dinner tendered its employes on Dec. 24. The dinner was served during the noon hours in the company's extensive dining rooms which were tastily decorated for the occasion. A string and vocal quartette added to the Christmas cheer.

The Omega Steel Co., Ansonia, Conn., has had its affairs placed in the hands of F. H. McCarthy, as temporary receiver. The company manufactures steel tools and supplies under a patent process, and, it is stated, has plenty of orders on hand, its difficulties being due to inadequate working capital. A new corporation may be organized to take over the property.

The William H. Page Boiler Co., Exeter, N. H., is planning the removal of its works to Meadville, Pa. The idea is to centralize at that point the business now being carried on at Exeter and Norwich, Conn. An extensive plant is in the course of construction at Meadville.

The Jahant Heating Co., Akron, O., is rejuvenating the Jahant furnace which has been on the market for a score of years. A number of changes have been introduced to put the furnace on an up-to-date basis. M. Otis Hower is president of the company, I. C. Allen, vice president and secretary and H. F. McGill, treasurer and manager.

The Bartlett Steel Co., Joplin, Mo., contractor and fabricator of steel for metallic structures, has been reorganized under the name of the Southwestern Bridge Co. The reason for this step was to avoid confusion with a concern of very much similar name doing business in Kansas City. The company has increased its capital stock to $100,000, and has also greatly enlarged the capacity of its plant. The following are the new officers: J. K. Wingert, president; A. Baker, vice president; E. J. Tutty, secretary; T. Sawyer, treasurer, and H. W. Klare, general manager.

A meeting of creditors of the Fort Wayne Iron & Steel Co. was held recently at the offices of the Fort Wayne Rolling Mill Co. Nominations for directors of the latter company for the ensuing year included E. H. Himer, Mole Cook, H. E. Frazier, B. A. Hengeman and C. A. Borst. The financial statement of the rolling mill company, at the close of business, Dec. 30, showed assets $95,381 in excess of liabilities.

The Jeffrey Mfg. Co., Columbus, O., has purchased two acres of ground lying just north of its present plant on which it proposes to build a number of switching tracks to connect with the tracks of the Big Four. This purchase gives the Jeffrey company three solid squares of land bordering on the line of the Big Four railroad.

The Amherst Malleable Iron Co., Ltd., which recently began operations at Amherst, N. S., occupies a tract of three acres, built on the Highlands along the I. C. R. tracks. The plant includes a brick and stone structure 65 x 264 feet for manufacturing purposes with a boiler and engine room in addition. There is also an office and pattern storage building, and some smaller buildings. A melting furnace with a daily capacity of 15 to 20 tons

is in blast, and the plant is provided with two double annealing ovens with a capacity of 12 to 14 tons of annealed castings per day. Mills for cleaning the castings are provided and the pattern shop is well equipped. N. Curry is president of the company, J. A. Crossman, first vice president; George Sauber, second vice president; and George S. Crossman, secretary and treasurer.

Stockholders of the Lynchburg Foundry Co., Lynchburg, Va., at a special meeting held Dec. 18, decided to increase the capital stock of the company to provide additional facilities for handling the enormous increase in business in each department.

The Pittsburg Reduction Co., Pittsburg, manufacturer of aluminum, has changed its name and will hereafter be known as the Aluminum Co. of America.

The Consolidated Sheet & Metal Works, Milwaukee, incorporated with a capitalization of $50,000 is a consolidation of several prominent sheet metal manufacturers of Milwaukee. The incorporators are: John and Fred Bogenberger, who have constituted the firm of F. Bogenberger & Bro.; Paul L. Biersach, who has been a member of the firm of Biersach & Niedermeyer Co., and William Hammann, who has for several years conducted a plant in that city. The company occupies the new factory which has been erected at 661-673 Hubbard street, which is of fireproof construction, 100 x 150 feet, one story and basement.

Trade Notes:—

The Davis & Farnham Mfg. Co., Waltham, Mass., has been awarded the contract for furnishing four engines for the Ridgewood pumping station on Long Island at a cost of about $400,000.

The Carnegie Steel Co. is to construct for the National City Bank of New York, a 300-ton steel vault to cost about $300,000. It will be built of armor plate of the double-deck type, and will be both fire and burglar proof.

The Cambria Steel Co., Johnstown, Pa., will build for the Wabash railroad, for shipment in the spring of 1907, 2,000 all-steel gondola cars.

Barwood & Snider, Philadelphia, on Jan. 1 assumed the sole representation in that district for the line of antifriction chain hoists manufactured by the Chisholm & Moore Mfg. Co., Cleveland, O., in the Philadelphia territory.

Fires:—

The machine shop and the testing, drilling and pattern rooms of the American Skein & Foundry Co., Racine, Wis., were damaged to the extent of $50,000 by fire Dec. 23.

The Bretting Iron Works, Ashland, Wis., lost its foundry room by fire Dec. 19.

The Clark Bros. Co., Belmont, N. Y., states that the recent fire at its plant was confined to the second floor of its office and that repairs have practically been completed. The plant itself was not affected.

Publicity Men Meet.—The meeting of the Technical Publicity Association, held Dec. 20, at the Aldine Association rooms, 111 Fifth avenue, New York, was devoted to the subject of "The Value of Circulars and Printed Matter." Frank Vreeland, art editor of the *American Printer,* spoke of the commercial value of beauty in typography, and Walter Gilliss, president of the *Gilliss Press,* New York, talked on the subject of limited editions. An experience meeting was also held at which the members told of their methods and results with printed matter and circular letters. The companies represented at the dinner by members of the association were: Ingersoll-Rand Co., F. R. Almond Mfg. Co., Pope Mfg. Co., H. W. Johns-Manville Co., Yale & Towne Mfg. Co., John A. Roebling's Sons Co., American Locomotive Co., General Electric Co., Patterson, Gottfried & Hunter, New York Edison Co., M. H. Treadwell Co., Crocker-Wheeler Co., A. S. Cameron Steam Pump Works and Ledgerwood Mfg. Co.

Pig Iron in France.—According to the American consul at Lyons the French government statistics concerning the output of iron and steel in France for the first six months of 1906 give the production of pig iron as 1,573,504 tons, an increase of 73,000 tons over the product in the same period of 1905. These figures indicate that the production of pig iron in France this year will exceed 3,100,000 tons for the first time in its history. It was nearly 3,100,000 tons in 1905.

The Norfolk & Western railroad is to double-track its line from Main street, Columbus, O., to Valley Crossing. In the same territory the Columbus Railway & Light Co. is seeking a franchise to extend its Leonard avenue line about one mile to Shepard and St. Marys of the Springs.

TWO MILLION TONS OF PIG IRON

Used in Building Steel Cars During the Past Year.

The American Metal Market estimates that the year 1906 will show about 90,000 all-steel standard gauge freight cars built in the United States. The distribution is about as follows:

Pressed Steel Car Co.	38,000
Standard Steel Car Co.	24,000
American Car & Foundry Co.	12,000
Cambria Steel Co.	5,000
Other makers	11,000

The "other makers" include the Ralston Steel Car Co., the Middletown Car Works and the Barney & Smith Car Co. These four concerns while comparatively new in the steel car business, have been operating practically all year, making seven distinct steel car companies which have been making steel cars practically all year, and operating a total of ten plants. The Pullman Co. and one or two others are preparing to make steel freight cars, or have already begun, but have contributed little to the year's output.

The Standard Steel Car Co. is building a plant in the west to have ultimately a capacity comparable with its present plant at Butler. With other new entries, and with other older builders increasing their facilities, the steel car making capacity is constantly growing. If demand should keep up we could easily see a production of 100,000 steel cars in 1907, and of 125,000 in 1908, without any actually new projects being brought out.

The production of 90,000 steel cars involves the consumption of about 1,000,000 tons of steel plates, besides large tonnages of structural shapes, which the makers outside of the Pressed Steel Car Co. use quite largely, axles, merchant bars, wheels, castings, etc. Altogether, the 90,000 steel cars would represent the consumption of fully 2,000,000 tons of pig iron, or eight per cent of the year's production, a heavy showing for one single industry.

This, however, does not represent the total consumption in this direction, since there are a number of small makers who do not make standard gauge cars, but produce a large number of all-steel cars of narrow gauge for mines and other industrial operations. Then there are wooden cars with steel sills, which use plates and shapes. Indeed, there are very few wooden cars of the old type made at the present time. The steel car makers expect a full run in 1907, although it is a fact that the outlook is not quite so good as it was a year ago.